(NASA-TM-X-73453) CONCENTRATIONS OF TRACE ELEMENTS AND COMPOUNDS IN THE AIRBORNE SUSPENDED PARTICULATE MATTER IN CLEVELAND, OHIO, FROM AUGUST 1971 TO AUGUST 1972 AND THEIR DEPENDENCE ON WIND DIRECTION:

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CONCENTRATIONS OF TRACE ELEMENTS AND COMPOUNDS IN THE AIRBORNE SUSPENDED PARTICULATE MATTER IN CLEVELAND, OHIO, FROM AUGUST 1971 TO AUGUST 1972 AND THEIR DEPENDENCE ON WIND DIRECTION:

COMPLETE DATA LISTING AND CONCENTRATION ROSES

by Robert B. King and Harold E. Neustadter Lewis Research Center Cleveland, Ohio 44135 June 1976





# NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER CLEVELAND, OHIO 44135



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OHIO, FROM AUGUST 1971 TO AUGUST 1972 AND THEIR

DEPENDENCE ON WIND DIRECTION: COMPLETE

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Lewis Research Center

#### SUMMARY

Concentrations of 75 chemical constituents in the airborne particulate matter were measured in Cleveland, Ohio during 1971 and 1972. Daily values, maxima, geometric means and their standard deviations covering a 1-year period (45 to 50 sampling days) at each of 16 sites are presented on microfiche for 60 elements, and for a lesser number of days for 10 polycyclic aromatic hydrocarbon compounds (PAH), the aliphatic hydrocarbon compounds (AH) as a group and carbon. In addition, concentration roses showing directional properties are presented for 39 elements, 10 PAH and the AH as a group. The elements (except carbon) are shown both in terms of concentration and percentage of the suspended particulate matter.

To aid the reader we have included a map showing the measurement locations. Also presented here are complete sets of concentration roses for 39 elements, 10 polycyclic aromatic hydrocarbon compounds (PAH), and the aliphatic hydrocarbons (AH) as a group. Table I lists the specific constituents

In previous publications (refs. 1 and 2) a fairly extensive analysis of the data from a 1-year study of the trace element and compound composition of the total suspended particulate matter (TSP) in the ambient air in Cleveland, Ohio was presented. Included were means and maxima of the 75 constituents determined for the period August 10, 1971 - August 10, 1972. However, because of the large volume of data involved (~30 000 separate data values), the individual 24-hour values were not presented. Substantial interest has been indicated in these values by individuals wishing to examine the data according to their own specific needs and interests. We are consequently making this data available as a convenient package on microfiche.

for which data is presented. Finally, the results of a linear correlation study of the hydrocarbons and carbon are included.

The experimental and data analysis procedures have previously been reported (refs. 1 and 2). Some of the previously reported values (means, etc.) for the hydrocarbons and carbon may differ slightly from those reported here because of a programming error in the earlier work that affected the results when more than two determinations were averaged to obtain a single value. This has been corrected and, hopefully, there are no further errors. In addition to the daily values and their percentage of the TSP, we have included the geometric means and their standard deviations, and the maximum value for each monitoring site for each constituent. It is important to note that the tables are a direct computer printout. Consequently, the number of places is not significant. The uncertainties associated with the data have previously been discussed (refs. 1 and 2).

The concentration roses were generated using this same data. The daily 24-hour values were separated using the resultant vector wind direction obtained from the National Weather Service (NWS) (ref. 3), and the mean value for each of 16 directions was plotted logarithmically on the polar plot, the direction of the line being that from which the (resultant) wind blew. Two sets of plots are presented for the elements (except carbon) - one (unmarked) as the concentrations in ng/m3 and the other (marked ''percent') as the percentage of the TSP. The plots for the hydrocarbons and carbon are in terms of ng/m<sup>3</sup> only. The values for the inner and outer circles and for the maximum are given in scientific notation. For example, for sodium (percent) the maximum value is 0.641E01, which means 6.41 percent. The elements are sequentially arranged according to their atomic number. Accompanying each plot is a chart showing how many values were averaged for each direction at each site. A minus one indicates that there were one or more 'less than' values (values below the detection limit of the method). When a 'less than' value is met, a value two-thirds of the smallest value for that site is entered for the average computation. Unfortunately, when a minus one is entered into the chart, the number of entries for that direction is not presented.

Since the wind did not blow exclusively from one direction over the 24-hour sampling period, the mean concentration for each direction was weighted for directional stability. The directional stability factor for the wind (totally stable  $\equiv$  1) is defined as the ratio of the vector wind velocity  $v_i$  to the scalar wind speed  $s_i$  for the ith day. The mean stability-weighted mean concentration of each constituent  $\overline{C}$  for each of 16 vector wind directions (0°, 22.5°, 45°, 67.5°, . . . , etc.) for which data was available was obtained from the equation

$$\overline{C} = \frac{\sum_{i} \frac{v_{i}}{s_{i}} C_{i}}{\sum_{i} \frac{v_{i}}{s_{i}}}$$

where  $C_i$  is the observed concentration of that constituent on the ith day. The summations were made over the days for which data was available. Values of  $v_i$  and  $s_i$  are available from the NWS tabulations (ref. 3). In the polar plots each wind direction line bisects a sector covering  $22\frac{1}{2}^{0}$  (e.g., at  $90^{0}$  (east) the sector coverage is from  $78\frac{3}{4}^{0}$  to  $101\frac{1}{4}^{0}$ ).

Wind data is available from two locations, one at Cleveland Hopkins Airport on the far southwest side and one at Burke Lakefront Airport on Lake Erie near downtown Cleveland. Wind data from one or the other was utilized for a site according to its location relative to these weather stations. Sites 1, 4, 6, 7, 10, 15, 17, 20, and 21 used Burke wind data while sites 2, 5, 8, 9, 12, 13, and 14 used Hopkins wind data. Obviously the farther the site is from the weather station, the less confidence one places in the directional results. This, in addition to the fact that the samples were collected over a 24-hour period during which the wind blew from several directions, cautions one to use the results with discretion. However, in our opinion they are an excellent indicator of emitting sources in the general direction shown.

Because a number of the hydrocarbons are considered carcinogenic to man and their individual analysis is difficult, we analyzed the hydrocarbon and carbon data to see what correlations exist to determine if the analysis of one or two might make possible the reliable estimation of a number of others. In general, we found no correlations that we felt were significant. The linear correlation coefficient for each pair (hydrocarbons and carbon) is listed in Table II.

#### REFERENCES

- King, Robert B.; et al.: Extensive 1-Year Survey of Trace Elements and Compounds in the Airborne Suspended Particulate Matter in Cleveland, Ohio. NASA TN D-8110, 1976.
- 2. Neustadter, H. E.; King, R. B.; and Fordyce, J. S.: Elemental Composition of Suspended Particulates as Functions of Space and Time in Cleveland, Ohio. NASA TM X-71688, 1975.

3. Climatological Data for Cleveland, Ohio, 1971 and 1972. National Weather Service, National Oceanic and Atmospheric Agency, 1971-1972.

#### TABLE I, - CONSTITUENTS FOR WHICH DATA IS PRESENTED

Elements

Hydrocarbons

Carbon Sodium

Aluminum

Silicon

Chlorine Potassium

Scandium Titanium

Vanadium

Chromium

Manganese

Iron

Cobalt Copper

Zinc

Gallium

Arsenic

Selenium

Bromine

Rubidium

Silver

Cadmium

Indium

Tin

Antimony

Cesium

Lanthanum

Cerium

Samarium

Europium

Terbium

Dysprosium

Ytterbium

Lutetium

Hafnium

Mercury

Lead

Bismuth

Thorium

3, 4-Benzopyrene (BaP) 1, 2-Benzopyrene (BeP)

Pyrene

1,2-Benzofluorene

Benz-m, n, o-fluoranthene

Benzacridine Benzanthracene 3, 4-Benzfluoranthene

Perylene

. 1,12-Benzoperylene

Aliphatic hydrocarbons as a group

TABLE II. - HYDROCARBON AND CARBON CORRELATION COEFFICIENTS FOR THE RATIOS LISTED

Symbol	Compound or element
A	Pyrene
В	1, 2-Benzofluorene
C	Benzo-m, n, o-fluoranthene
D	Benzacridine
E	Benzanthracene
F	3, 4-Benzofluoranthene
Ģ	1, 2-Benzopyrene
H	-3, 4-Benzopyrene
I	Perylene
J	1, 12-Benzoperylene
K	Aliphatics (total)
L	Carbon (before)
M	Carbon (after)

Ratio		. <u></u>		· · · · · · · · · · · · · · · · · · ·		.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	· · · · · · · · · · · · · · · · · · ·	Si	tes							
	1	3	4	5	6	7	8	9	10	12	13	14	15	17	20	21
в:А	0,818	0, 771	0.456	0.582	0.374	0.453	0.194	0.693	0, 659	0.728	0, 476	0. 133	0.325	0.676	0.766	0, 773
C:A	. 887	.123	. 740	088	.334	. 147	056	.596	. 267	032	. 835	. 225	.116	.342	.716	. 200
C:B	. 573	-, 142	. 199	, 111	, 383	. 135	.010	.385	. 172	.160	. 467	.048	216	. 212	. 441	. 268
D:A	.996	093	. 343	. 685	.968	. 461	. 292	.333	.383	. 883	.947	, 785	.540	, 885	,994	. 308
D:B	.948	. 034	621	.016	. 989	. 758	. 640	. 258	. 283	.955	. 697	. 728	. 926	. 881	. 693	. 923
D:C	.998	.003	. 626	-, 149	. 724	. 111	. 252	.539	061	.432	. 795	. 524	.665	.967	.992	.613
E:A	.367	. 143	007	. 269	. 406	. 013	111	, 586	. 446	. 023	.069	~, 057	.091	. 226	. 026	. 544
E:B	. 685	.030	. 190	. 562	. 924	. 644	005	.601	. 281	.646	.180	. 599	.360	, 423	-, 059	. 739
E:C	.126	. 294	064	. 647	.489	. 105	065	. 877	. 174	. 184	. 224	.514	071	025	107	.302
E:D	.506	. 220	.089	. 651	. 834	. 795	539	.503	.067	217	. 885	. 769	.702	.927	.969	. 873
F:A	.914	.337	039	.489	.429	.658	. 246	. 209	.612	.399	.015	.190	.112	.701	.807	. 605
F:B	. 720	.072	. 463	. 702	. 139	. 763	. 590	.712	.390	.526	.118	004	. 162	. 504	.585	. 644
F:C	. 760	. 613	087	.048	. 491	. 201	069	, 200	. 136	. 242	.166	. 244	088	.640	. 832	.368
F:D	.943	.075	.920	. 590	017	. 638	. 575	136	,067	.442	.716	.965	.601	.981	.998	.917
F:E	, 467	. 241	,477	, 832	.377	. 285	018	. 453	.026	. 266	.982	. 467	.094	.057	.044	.597
G:A	. 939	.511	. 458	.475	. 612	. 540	. 251	.198	.774	. 515	. 232	.031	. 612	. 460	. 767	.590
G:B	. 690	. 252	.543	.712	. 122	. 525	.576	. 725	.417	. 522	. 493	081	. 304	.363	. 563	.518
G:C	. 801	. 256	. 524	.008	024	. 033	062	. 254	. 289	.004	. 290	. 282	-, 184	. 515	818	.301
G:D	.973	-,142	.717	. 731	.326	.334	.464	302	. 830	.384	.713	. 753	. 871	. 721	. 100	. 607
G:E	.397	.069	.549	. 842	.136	.087	. 093	.492	.039	.176	.079	. 433	292	. 043	038	.512
G:F	.991	.578	. 760	.967	. 523	. 621	. 884	.891	.564	.675	.708	.908	.311	. 749	989	.928
H:A	.958	, 285	. 726	.422	.182	. 125	.100	.189	.738	. 658	. 230	.060	, 640	.407	. 880	. 597
H:B	. 658	.063	. 267	. 476	077	. 247	. 260	.736	. 415	.710	. 624	056	.306	. 292	. 573	.565
H:C	.906	.195	.976	087	~. 095	001	116	.147	. 270	.100	. 203	.322	165	.477	. 819	.314
H:D	.980	041	. 238	.747	300	. 653	. 267	257	.388	.528	.780	. 793	. 999	. 735	.991	.707
H:E	. 299	.138	103	. 230	.128	. 201	. 465	.340	.081	.169	. 221	. 525	. 095	.032	019	.512
H:F	.952	. 745	055	.686	. 273	.343	. 790	.840	.748	.732	. 248	.905	. 259	, 751	.993	.931
H:G	.973	747	. 537	. 696	. 668	.325	. 872	.949	. 856	.818	. 847	.929	. 824	858	.987	.987
I:A	.929	.270	,663	,395	.698	.399	.488	.341	.539	.444	. 233	-,060	.628	.085	. 852	.712
I:B	. 676	030	. 253	. 610	. 243	.436	, 238	, 763	. 323	. 632	.567	173 ·	. 322	. 204	, 659	.588

TABLE II. - Concluded.

Ratio								Si	tes							
	1	3	4	5	6	7	8	9	10	12	13	14	15	17	20	21
I:C	0.963	0.928	0, 960	0.027	0.074	025	154	0.429	0.161	0.023	0.198	0. 257	250	0.094	0.503	0.198
I:D	.976	137	. 463	.782	.905	.188	.384	.404	.880	. 375	. 187	. 735	. 893	. 083	. 999	.572
I:E	.323	. 427	. 103	.952	. 234	.104	162	. 647	.021	.374	. 563	.489	. 221	.378	015	. 525
I:F	. 882	.769	. 069	.930	. 353	.555	.808	.868	. 605	. 539	.578	. 872	.476	. 285	. 605	.918
I:G	.902	.395	. 599	.948	. 871	. 433	. 930	.931	. 803	. 865	. 955	.923	.931	. 585	. 599	.975
I:H	.971	.398	.963	. 451	. 887	.328	.882	. 852	.714	. 752	. 900	.887	.918	. 475	. 851	. 975
J:A	.909	.332	. 056	.128	.322	.137	002	. 131	. 229	.404	244	260	.450	.397	. 731	.368
J:B	.560	. 125	. 222	.452	015	.494	.054	.668	. 190	.530	.062	053	.080	. 340	.378	. 431
J:C	.968	.039	125	.150	. 589	. 266	052	.080	.098	.460	022	.080	195	. 453	782	.391
J:D	.992	137	.921	481	621	.144	. 238	115	. 495	. 740	. 891	158	.184	. 897	.100	. 973
J:E	.092	046	. 259	.308	.592	.672	055	. 277	.033	. 164	-, 185	020	. 163	. 191	.029	.475
J:F	. 819	. 280	. 563	. 421	. 831	.401	. 523	. 835	. 421	. 485	180	.395	007	. 570	. 759	.911
J:G	. 866	. 862	.379	. 471	.514	. 216	.391	. 838	. 274	. 336	010	. 296	. 727	. 419	. 781	. 810
J:H	. 945	. 547	034	. 456	.337	.365	.384	. 853	.334	.305	. 496	. 276	. 808	.582	. 735	. 825
J:I	.947	.108	080	.395	. 364	.419	.482	. 764	. 410	.378	009	. 221	. 759	. 202	.901	. 740
K;A	, 875	. 037	. 224	. 690	. 694	-, 238	-, 071	, 148	. 260	.467	. 708	140	. 386	. 465	. 445	. 873
K:B	. 699	. 141	523	. 353	094	.457	.188	218	296	. 599	. 898	<b>~.</b> 087	254	.384	153	. 688
K:C	. 639	150	. 461	235	084	.551	036	. 276	. 434	.430	. 408	.315	049	.325	. 213	.398
K;D	. 653	415	.100	.524	.647	.394	097	, 705	-,332	867	. 275	.659		269	.100	100
K:E	. 799	120	. 262	. 251	017	. 623	.084	. 287	301	. 456	. 937	.177	. 157	. 262	001	. 668
K:F	.501	280	. 287	. 691	.442	.429	. 233	324	. 249	. 599	. 692	. 847	.406	365	. 219	. 710
K:G	.566	.013	219	.707	.668	-,028	.324	394	.650	. 292	, 935	.761	.419	. 271	. 265	. 637
K:H	. 486	.001	.320	. 736	.319	. 291	.330	412	.536	. 544	. 959	.848	. 220	017	.067	. 257
K:I	.566	.012	.446	. 776	. 758	. 153	.140	509	. 597	.350	. 962	. 822	.572	.044	.106	.671
K:J	. 223	329	.504	262	.468	.414	.033	321	330	. 225	.318	.364	. 261	, 136	.486	. 477
L:A	. 423	. 381	.051	.489	. 725	. 279	.116	062	.436	.507	.069	139	061	. 400	.702	777
L:B	.646	. 252	136	.351	.091	.615	047	097	.191	. 745	. 335	.048	027	. 294	.551	.420
L:C	. 209	. 141	.057	093	. 276	.111	.064	200	.165	.127	038	, 135	297	.032	.570	. 281
L:D	. 850	280	036	. 628	.336	.646	401	237	. 216	. 728	. 746	. 433	.962	. 423	.100	. 679
L:E	.552	. 272	191	.082	. 230	.416	.101	218	082	. 476	.117	.378	. 270	124	.444	. 375
L:F	.341	. 435	.083	. 222	.564	.613	. 299	.010	.373	.544	. 165	,723	, 255	. 295	. 603	.517
L:G	.328	.508	.048	. 283	.389	. 259	. 285	.111	.376	.516	. 655	. 691	. 275	. 087	. 535	. 498
L:H	. 297	.402	.099	.316	.083	.327	.450	.098	.426	. 734	. 823	.750	. 280	058	. 494	. 445
'T:I	.314	. 282	.013	. 182	. 136	.349	. 288	.030	. 246	.584	. 705	.639	.509	-, 147	. 479	, 532
L:J	. 203	. 375	.388	164	.359	. 226	.392	048	045	. 222	. 074	.529	.349	. 162	. 498	. 425
L:K	. 854	.510	144	. 847	. 855	.734	.652	. 403	.606	.687	1	.919	. 560	. 749	. 280	. 656
M·A	.437	. 227	.027	.579	.574	. 255	. 216	086	. 288	.405	.076	138	189	277	, 671	, 742
M:B	. 643	.111	183	.334	006	.599	.011	110	. 199	. 638	, . 291	.122	248	. 214	.537	. 382
M:C	. 254	. 151	.045	080	. 249	.143	.105	158	.129	. 129	062	.088	283	. 131	.557	. 271
M:D	.910	~. 289	~.507	. 673	. 454	.488	281	269	.131	. 485	. 499	.519	. 708	. 321	.100	.616
M:E	.522	. 235	-, 226	009	. 172	.355	040	194	115	.503	.047	.385	.044	105	. 415	. 223
M:F	. 297	.300	086	.161	. 451	.577	.343	119	. 242	.528	.038	.708	.055	. 215	.534	. 668
M:G	. 279	.468	070	. 219	. 287	. 227	. 265	.064	.314	. 445	.513	. 620	.073	.105	.471	. 646
M:H	. 278	.326	.108	.318	.033	.312	. 383	.068	.304	647	. 691	. 682	. 047	072	. 429	. 622
M:I	.339	. 235	.028	. 115	. 128	.354	. 239	027	. 200	. 535	. 567	. 615	. 178	111	.396	. 669
M:J	. 243	.341	.137	123	. 266	. 230	. 425	054	164	. 196	288	. 493	.082	. 186	. 464	. 545
M:K	895	477	.008	.984	.725	.614	.397	.500	.741	. 696	771	. 883	. 290	.781	.311	. 719
M:L	.927	.907	. 847	. 939	.911	.916	. 864	.937	. 894	. 905	. 838	. 960	. 855	. 807	. 974	. 815

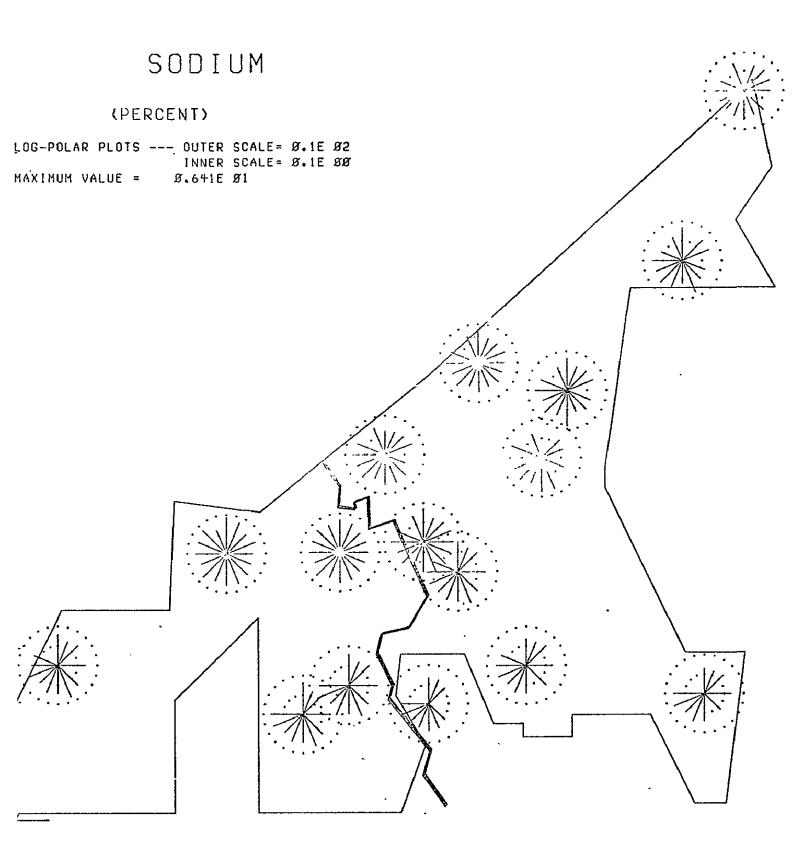


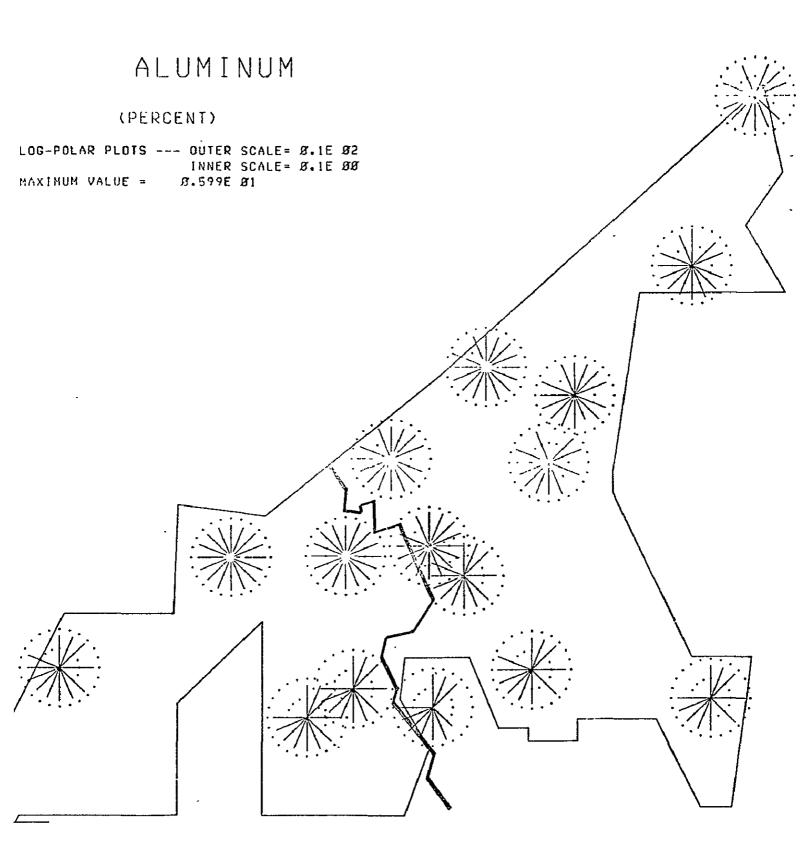
SODIUM

(PERCENT) NUMBER OF READINGS

## MIND FROM

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	7	•	1	1	7	3	1	1	1	2	2	3	3	7	7	خ	1	5
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	13	•	3	4	-1	Ø	Ø	Ø	-1	1	5	6	4	4	4	Ø	Ø	Ø
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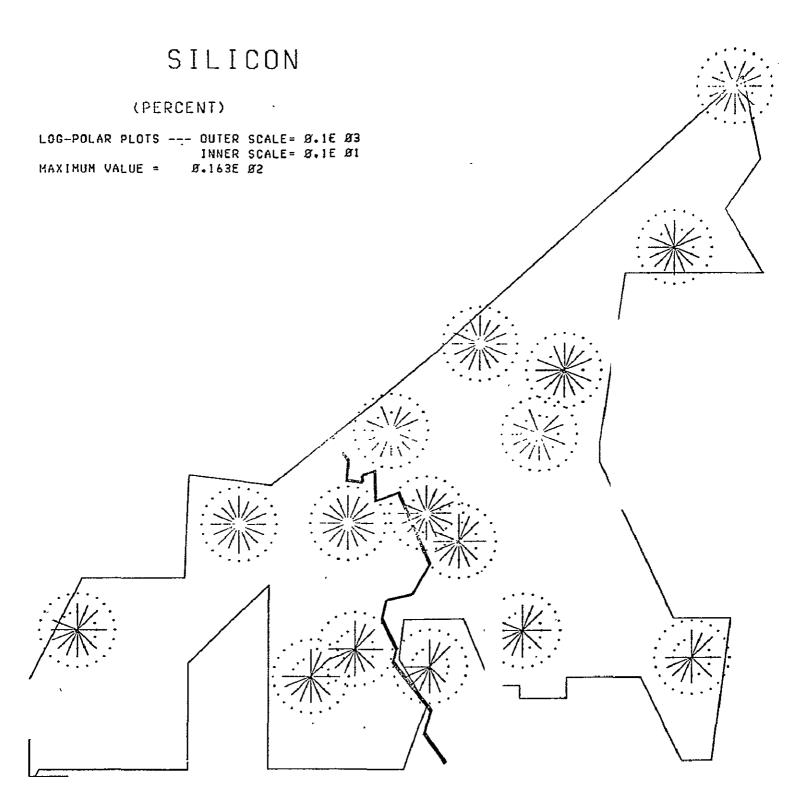
ALUMINUM

1 INDICATES ESTIMATED VALUE

CPERCENTS NUMBER OF READINGS

133. 135K

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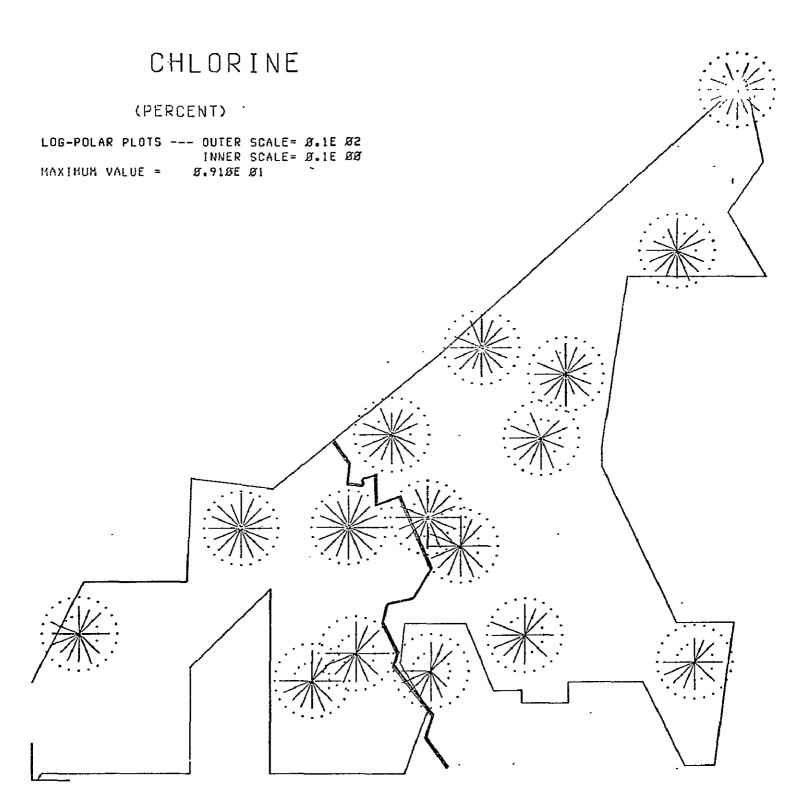
SILICON

(PERCENT)

# NUMBER OF READINGS

### WIND FROM

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	5	-		3	3	5	Ø	3	Ø	2	Ø	6	8	4	4	2	1	Ø	Ø
	6	-		1	Ø	5	3	Ø	5	1	2	1	1	5	4	5	1	Ø	3
	7	-		i	1	S	4	ı	2	1	3	4	3	4	7	7	3	1	4
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	12			4	3	4	Ø	3	Ø	5	3	9	11	6	3	3	1	Ø	<b>B</b> .
	13	<b>.</b>		3	4	ì	Ø	Ø	Ø	1	1	4	7	4	4	4	Ø	Ø	.a
	14	-		4	1	4	B	3	Ø	ı	Ø	8	7	2	3	3	Ø	Ø	ø
	15	-		1	2	7	4	1	2 -	1	3	2	3	4	7	8	4	1	4
	17	•		1	1	7	4	Ø	1	1	1	4	3	5	6	5	4	Ø	3
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CHLORINE

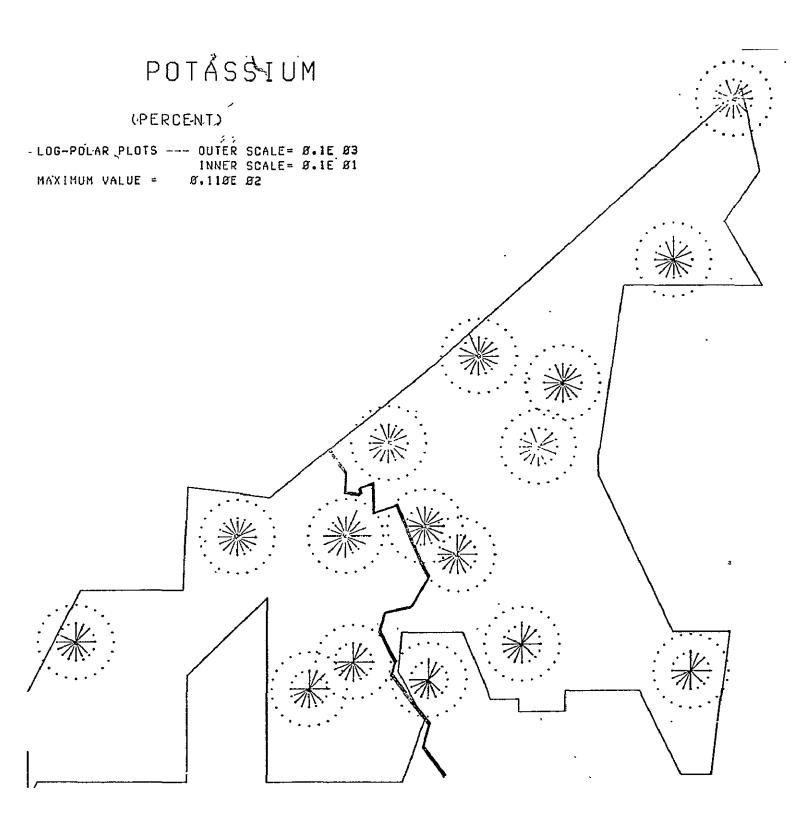
(PERCENT)

NUMBER OF READINGS

HIND FROM

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	4	**	Ø	8	s	1	Ø	2	Ø	í	i	5	5	4	6	2	Ø	3
	5		2	3	5	Ø	3	Ø	5	Ø	6	8	4	4	2	1	Ø	Ø
	6	-	1	ø	5	3	Ø	5	1	1	1	1	5	4	5	1	Ø	3
	7		1	1	8	4	1	5	1	2	4	3	4	7	7	3	1	3
لية	8		3	3	4	Ø	3	Ø	s	3	9	iø	6	4	5	Ø	Ø	Ø
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	12	-	3	3	4	a	3	Ø	2	3	8	1Ø	6	3	3	1	Ø	Ø
	13	•	3	4	i	Ø	Ø	Ø	1	1	4	7	4	4	4	Ø	Ø	Ø
	14	-	5	1	4	Ø	3	Ø	1	Ø	7	7	S	3	3	Ø	Ø	Ø
	15	•	1	2	7	4	1	2	1	2	2	3	4	7	8	4	1	3 .
	17		1	1	7	.4	Ø	1	1 -	-1	4	3	5	6	5	4	Ø	3
	. 58	-	Ø	1	6	2	1	Ø	2	S	3	2	2	4	5	2	Ø	4
	21	•	1	1	7	5	Ø	1	2	2	3	5	3	6	6	4	Ø	3

\_ -1 INDICATES ESTIMATED VALUE



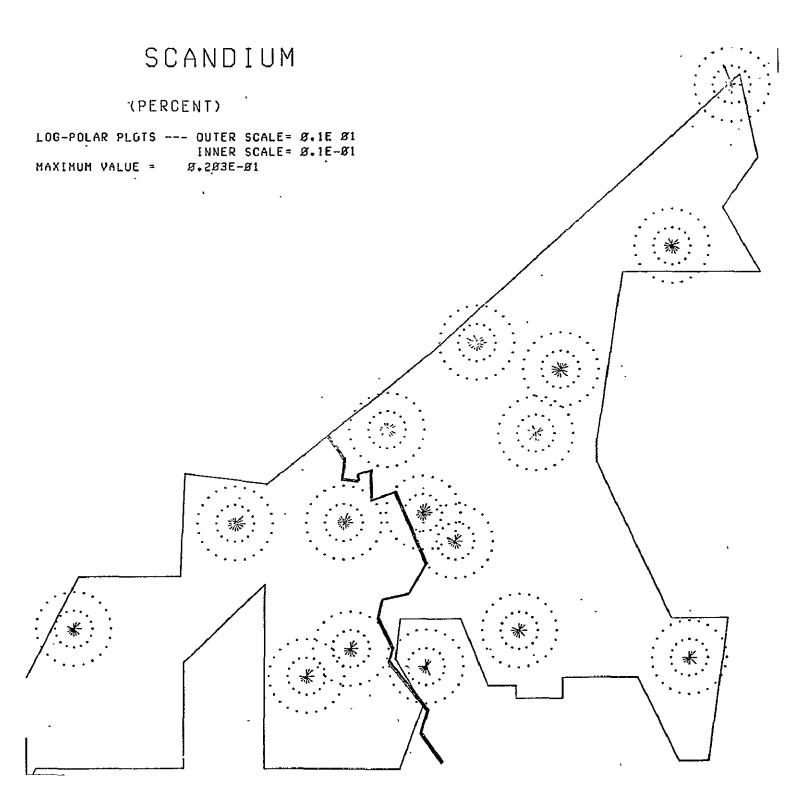
POTASSIUM

(PERCENT)

NUMBER OF READINGS

#### KIND FROM

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	5	•	2	2	3	œ	3	Ø	-1	Ø	2	5	3	1	1	-1	Ø	Ø
	6	-	1	ø	4	3	ø	1	1	-1	-1	1	4	5	3	- i	æ.	3
	7	~	-1	-1	5	3	i	1	-1	- 1	5	5	3	5	3	- i	- 1	3
ப	8		3	2	2	Ø	3	ø	-1	-1	4	6	5	-1	1	Ø	Ø	Ø
<u>-</u>	9	-	3	i	S	Ø	3	ø	-1	1	3	7	3	2	3	<b>- 1</b>	Ø	ø
ഗ	18	-	1	-1	5	3	1	1	-1	-1	1	1	5	6	4	1	Ø	4
	1~	-	1	2	2	ធ	3	ø	-1	-1	4	7	5	1	3	- 1	Ø	Ø



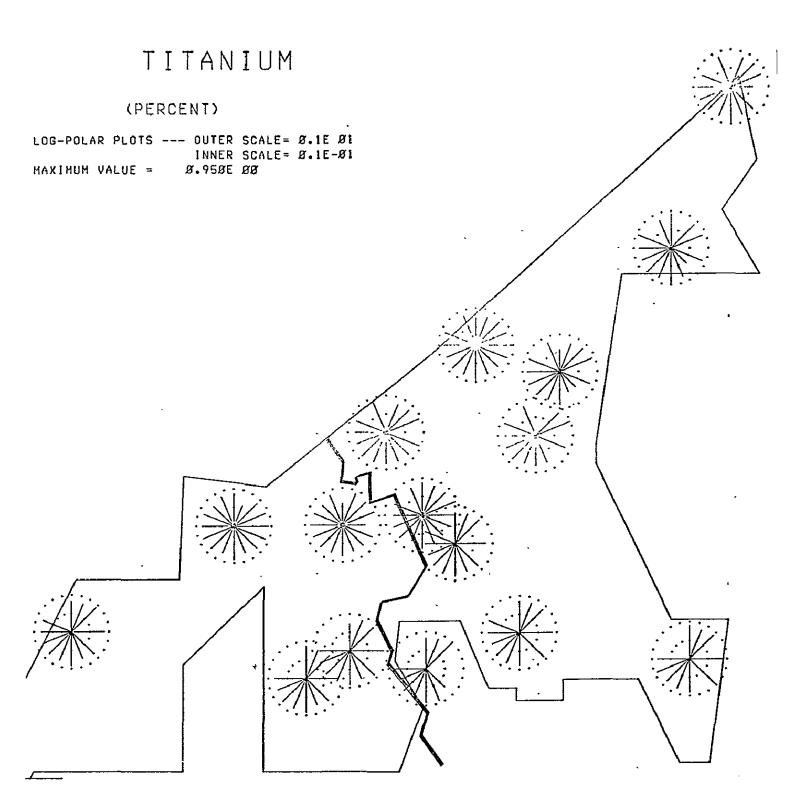
SCANDIUM

(PERCENT)

NUMBER OF READINGS

KIND FROM

NNE NE ENE E ESE SE SSE S SSW SW MSM M į - $\boldsymbol{z}$  $\mathcal{B}$ Ø Ē  $\mathfrak{S}$ . 1 Ø \$ Ø Ø Ø Ø Ø Ø Ø Ø Ø Ì Ø Ø Ø Ø Ø Ø 1 ' S Ø -1 Ø 2Ø S 8. 21 -Ø



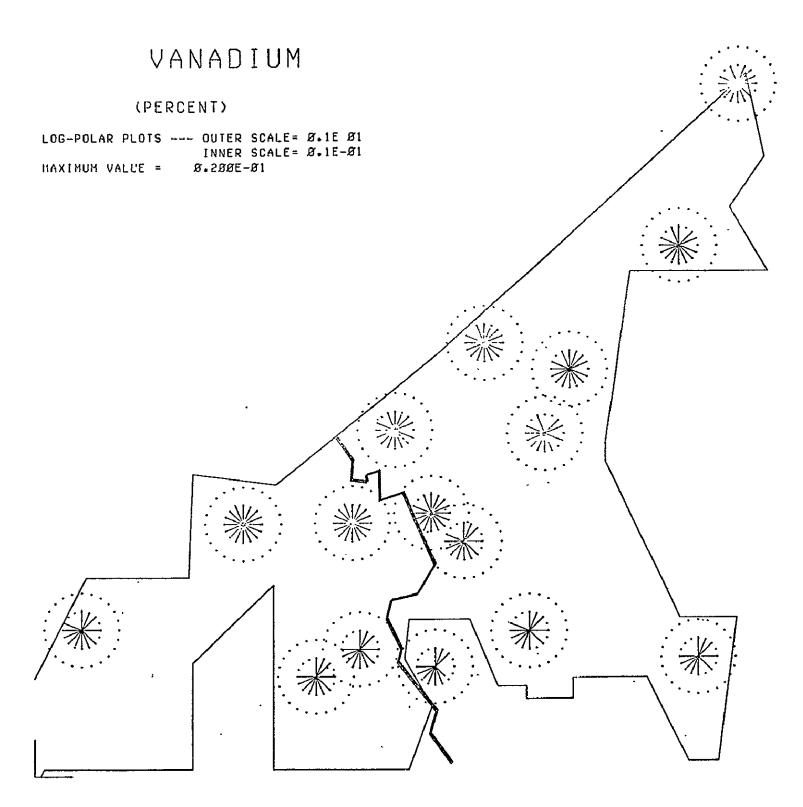
TITANIUM

(PERCENT) NUMBER OF READINGS

MING FROM

NNE NE ENE E ESE SE SSE S SSW SW 1 2 3 -2 3 2  $\boldsymbol{z}$ 3 2 5 8  $\mathfrak{B}$ ß g 2 Ø Ø 5 2 5 Ø Ø Ø 3 5 3 Ø 2 Ø Ø Ø 5 5 Ø 3 3 Ø 2 -1 Ø 3 Ø 2 7 5 2 S 18 8 3 1 2 1 2 3 8 Ø 2 3 2 3 2 Ø 12 Ø 3 Ø 2 3 5 3 Ø 3 1 13 -3 Ø Ø 3 7 7 2 3 14 -3 Ø Ø 1 Ø Ø 4 -1 2 3 15 --1 5 17 -Ø Ø 3 S Ø 2 3 28 -Ø 2 -1 Ø 1 - 1

<sup>-1</sup> INDICATES ESTIMATED VALUE



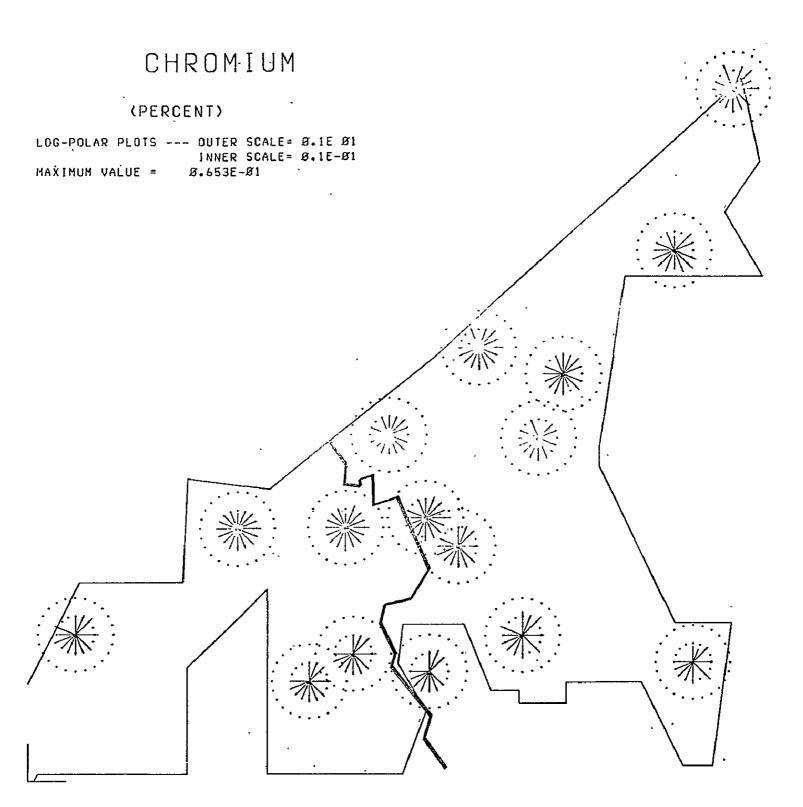
VANADIUM

(PERCENT)

# NUMBER OF READINGS

### WIND FROM

			N	NNE	NE	ENE	Ε	ESE	ξE.	SSE	S	SSW	SW	พรพ	W	MNM	NW	MNN
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	4	-	Ø	Ø	2	i	Ø	s	Ø	1	1	2	5	4	6	2	Ø	3
	5		3	3.	5	Ø	3	Ø	2	Ø	6	8	4	4	2	1	Ø	Ø
	6	-	1	Ø	5	3	Ø	2	1	2	1	1	5	4	5	1	Ø	3
	7	-	1	1	٤	4	1	s .	1	3	4	3	1 <sub>F</sub>	7	7	3	1	4
1.1	8	•	3	3	4	Ø	3	Ø	5	3	1Ø	1Ø -	6	4	5	Ø	Ø	Ø
I T E	9	-	4	s	4	ø	3	Ø	1	2	8	9	4	5	4	1	Ø	Ø
S	18	-	1	i	8	3	1	2	i	2	3	i	6	8	8	4	Ø	5
	12	•	4	3	4	Ø	3	Ø	s	3	9	1 1	6	3	3	1	Ø	Ø
	13	•	3	4	1	Ø	Ø	Ø	1	1	4	7	4	4	4	Ø	Ø	Ø
	14	•	4	1	4	Ø	3	Ø	1	Ø	8	7	s	3	3	Ø	Ø	Ø
	15	•	i	2	7	4	i	5	1	3	2	3	4	7	8	4	1	4
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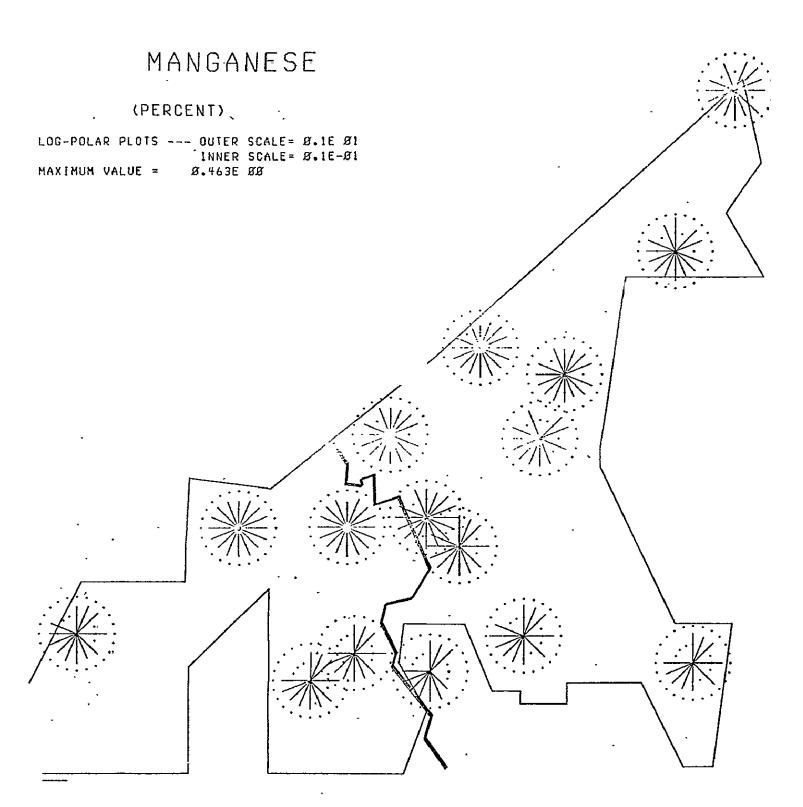
CHROMIUM

(PERCENT)

NUMBER OF READINGS

## WIND FROM

NNE NE ENE E ESE SE SSE S SSW SW WSW W 5 2 5 2 3 3 2 3 e 2 9 11 5 8  $\mathfrak{Z}$  $\mathfrak{g}$ ż Ø Ø S Ø Ø  $\mathfrak{g}$ 5 Ø 3 3 Ø 3 Ø 5 2 Ø Ø 5 5 Ø. -1 5 2 3 Ø 1 Ø Ø 3 2 3 18 Ø 18 -1 8 3 2 1 1 3 1 6 Ø 2 12 3 3 11 3 Ø 13 Ø a a 2 Ø 14 -5 S 3 3 Ø Ø Ø Ø 4 7 15 -17 .-1 7 Ø 1 '-1 3 5 5 Ø 2 2 2 Ø 2Ø Ø 1 Ø 3 ø 2 2 3



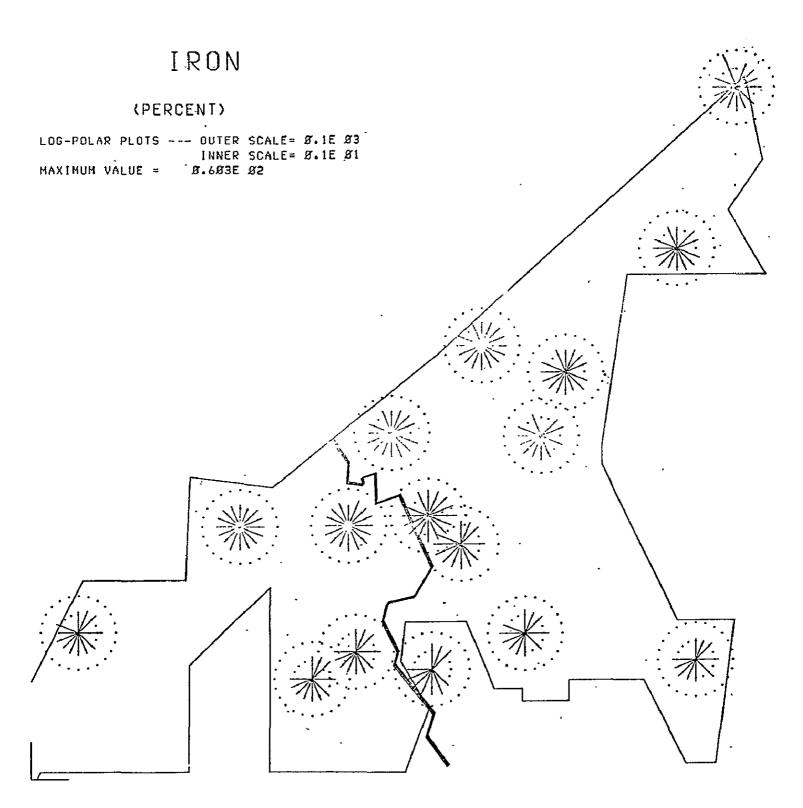
MANGANESE

(PERCENT) NUMBER OF READINGS

#### WIND FROM

NNE NE ENE E ESE SE SSE S SSW SW NSW W WAN WA WAM 1 - 1 1 t<u>.</u> 1 1 S 2 5 3 ٢, 3 2 13 £ 2 8 Ø Ø 2 Ø Ø 2 8 2 2 Ø 1 5 Ø 3 1 Ø 5 Ø 5 3 3 3 Ø 2 2 Ø 1.0 6 Ø Ø Ø 3 2 3 1 5 Ø 8 Ø 18 1 8 1 2 1 1 3 1 6 Ø 8 11 6 12 -3 3 3 ·Ø 2 3 3 3 Ø Ø **3** 13 -7 1 ß 3 Ø Ø Ø

SITE

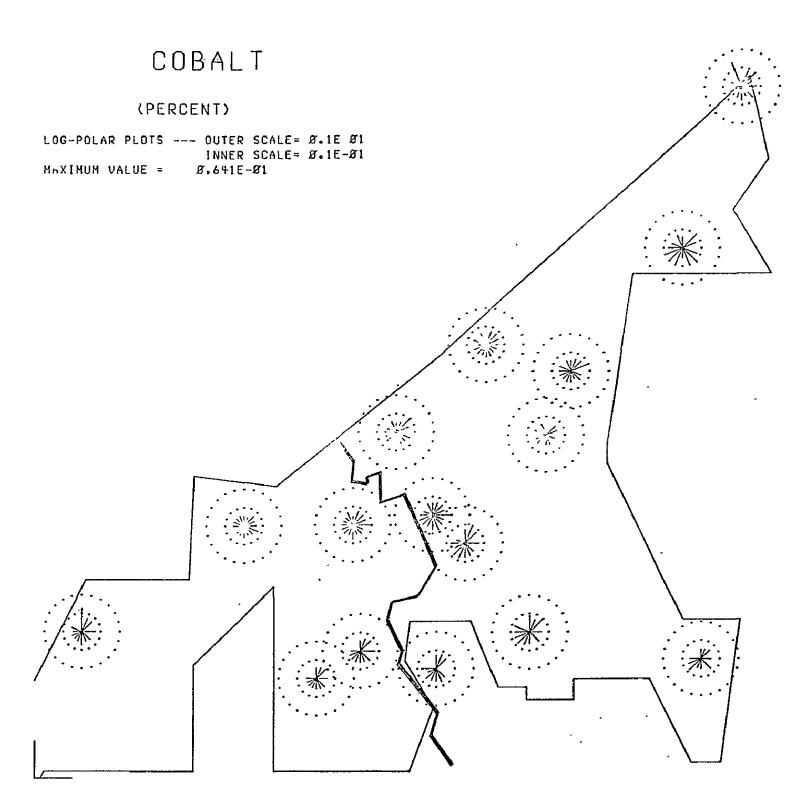


IRON

(PERCENT) NUMBER OF READINGS

#### WIND FROM

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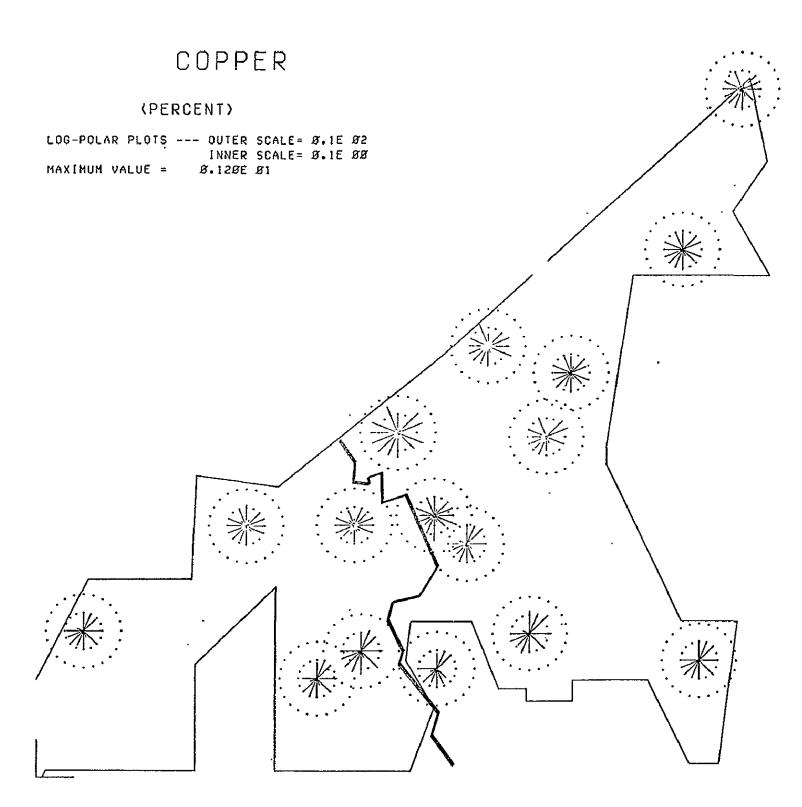


COBALT

(PERCENT) NUMBER OF READINGS

HIND FROM

ESE SE SSE S SSW SW Ø 2 3 Ø 11 Ø Ø Ø Ø Ø Ø 2 Ø 2 Ø 5 2 · ø 3 ø ٠ 3 3 5 Ø 3 S Ø 2 Ø Ø B  $\mathcal{B}$ 2 3 i 1 í 5 2 3 7 7 3 8 3 5 Ø 3 Ø 3 Ø Ø Ø 18 6 2 Ø 3 2 4 Ø Ø 18 .8 Ø 4 8 3 2 1 3 12 ,3 Ø 3 ø 3 Ø 13 Ø Ø Ø . 1 3 Ø Ø Ø Ē Ø 14 4 Ø 3 2 3 3 Ø 2 3 15 2 5 2 3 17 1 7 Ø -1 3 5 5 Ø 5 2 4 28 5 Ø 2 5 3 2 Ø 21 7 2 Ø 1 2 2 3 2 3 Ø 3

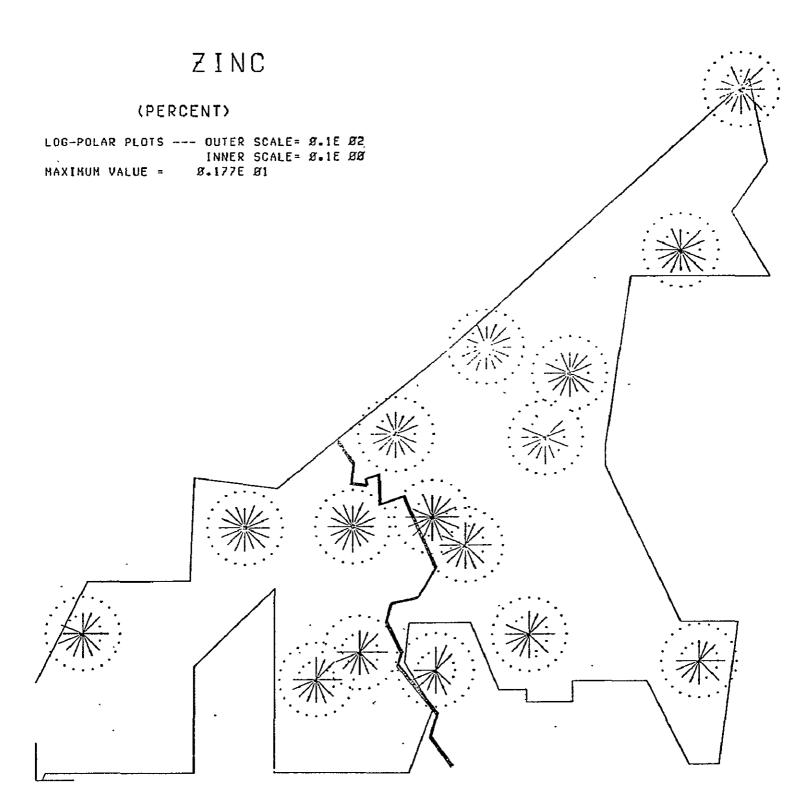


COPPER

(PERCENT) NUMBER OF READINGS

KIND ESOM

NNE NE ENE E ESE SE SSE S SSW SW WSW 2 2 Ø 3 3 Ø Ø Ø Ľ 2 ø 2 5 3 3 -1 2 2 4 Ø 3 Ø Ø 3 Ø Ø -1 3 Ø 5 3 2 1 Ø 5 5 3 -1 3 - i 6 1. 5 - } 4 į 2 Ø Ø 3 3 Ø Ø Ø -1 2 Ø Ø 1 3 Ø 3 Ø -1 5 6 4 2 Ø 18 **- 1** 3 3 1 6 6 Ţ 5 -1 -1 2 3 Ø Ø 12 3 3 Ø 1. 3 3 Ø 3 Ø Ø Ø 13 Ø Ø 1 3 2 Ø Ø Ø 14 Ø Ø Ø 5 3 3 15 -1 5 2 5 1 **-1 -1** -1 17 5 2 5 5 2 Ø 3 Ø -1 3 ø 2 2Ø 2 3 2 3 . Ø 4 21 ٠1 Ø -1 -13 2 3 3 2 Ø 3 -1



ZINC

(PERCENT

# NUMBER OF READINGS

WIND FROM

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		3			3	3		4	Ø.	3	Ø	2	3	9	1 i	6	5	4	Ø	Ø	Ø
		4	-		Ø	Ø		2	1	Ø	s	Ø	1	1	2	5	4	6	2	Ø	3
		5	•		3	3		5	Ø	3	ø	2	Ø	6	8	4	4	5	1	Ø	Ø
		6	-		1	Ø		5	3	Ø	2	1	1	1	i	5	4	5	1	Ø	3
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		17	-		1	1		7	4	Ø	1	1 -	-1	4	3	5	6	5	4	ø	3
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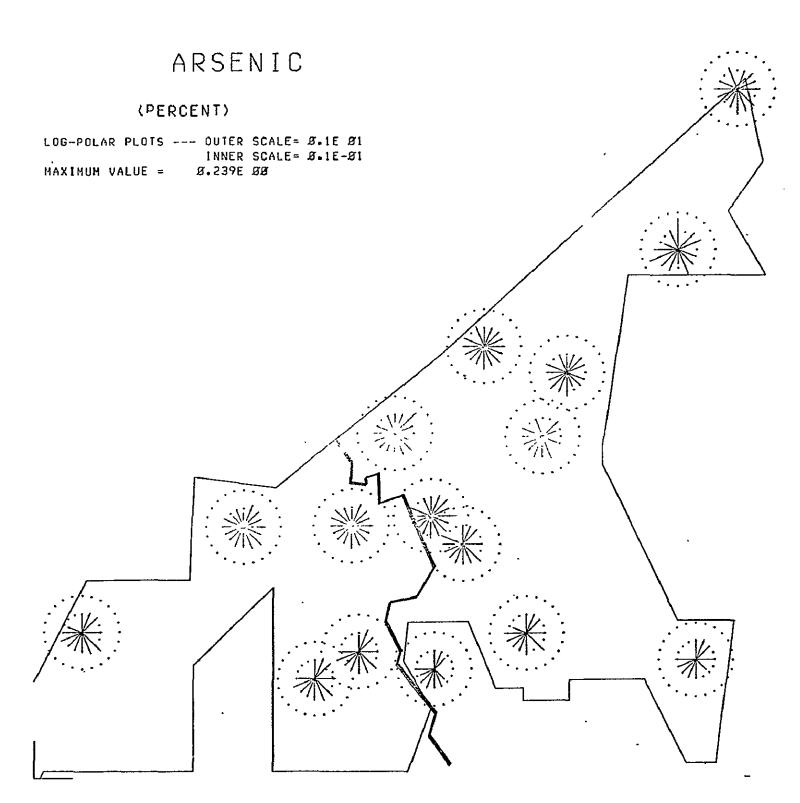
# GALLIUM (PERCENT) LOG-POLAR PLOTS --- OUTER SCALE= 8.1E 81 INNER SCALE # .1E-#1 #.261E ## MAXIMUM VALUE =

GALLIUM

(PERCENT) NUMBER OF READINGS

### WIND FROM

ENE E ESE SE SSE S SSW SW -1 -1 -13 2 -1 2 2 5 Ø Ø 2 - 1 1 1 Ø 1 1. **-** j -1 Ø Ø 2 2 13 -1 -1 12 - 2 2 13 -1 Ø -1 1 3 2 14 1 1 Ø 1 2 -1 Ø Ø Ø -1 15 --1 2 **-1** 1 -1 17 --1 -12 2 Ø 1 -1 2 i' 28 <del>-</del> 3 -1 -1 Ø Ø



ARSENIC

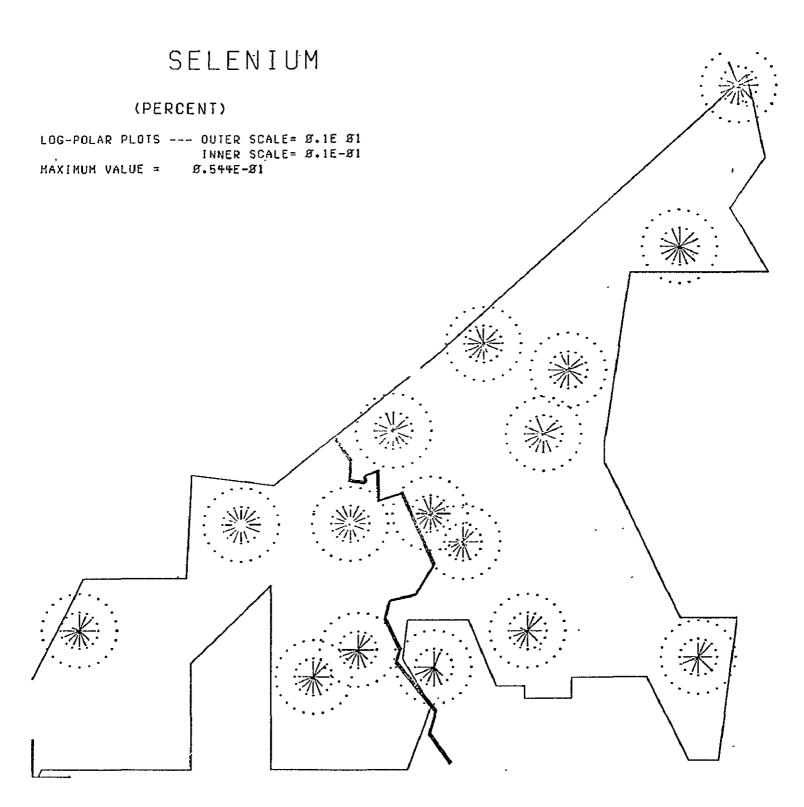
(PERCENT)

# NUMBER OF READINGS

### WIND FROM

				N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	H	нин	NW	NNW
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	3			2	3	3	Ø	3	Ø	1 .	3	6	8-	6	4	4	Ø	Ø	Ø
	4-	-		B	ø.	2 -	-1	Ø	1	Ø	1	1	5	4	4	4	1.	Ø	3
	5			3	3	4	Ø	3	Ø	1	Ø	4	6	4	4	2	1	Ø	Ø
	6	<b>-</b>		i	Ø	4	3	B	1	1	1 -	- 1	1	4	4	5 -	- 1	Ø	3
	7	<b></b>	•	- 1	1	7	3	1	1	1	5	2	3	3	6	7	2	- j	3
ы	8	<b></b>		3	3	3	Ø	3	Ø	1	3	6	7	5	3	2	Ø	Ø	Ø
<u> </u>	9	•		3	2	3	Ø	3	Ø	1	2	5	7	4	5	4	1	Ø	Ø
S	18	-		1	i	7	3	1	1	1	1	1	1	5	8	8	3	Ø	4
	12	-		3	3	3	Ø	2	Ø	1	2	5	6	6	3	3	- 1	Ø	Ø
	13			3	4 .	-1	Ø	Ø	Ø.	-1	1	2	6	4 .	5	4	Ø	Ø	Ø
	14			2	i	3	Ø	3	Ø.	-1	Ø	4	5	2	3	3	Ø	Ø	Ø
	15			1	2	7	3	1	1	1	5	S	3	4 -	7	6	3	1	3
	17	•		1	1	6	3	ß	1	1 -	-1	1	3	4	6	5	3	Ø	3
	S&	#		Ø	1	6	2	1	Ø	2	2	1	S	1	4	5	5	Ø	4
	21	•		1	i	7	i	Ø	1	2	5	2	2	5	6	6	5	ø	3

\_\_ -1 INDICATES ESTIMATED VALUE

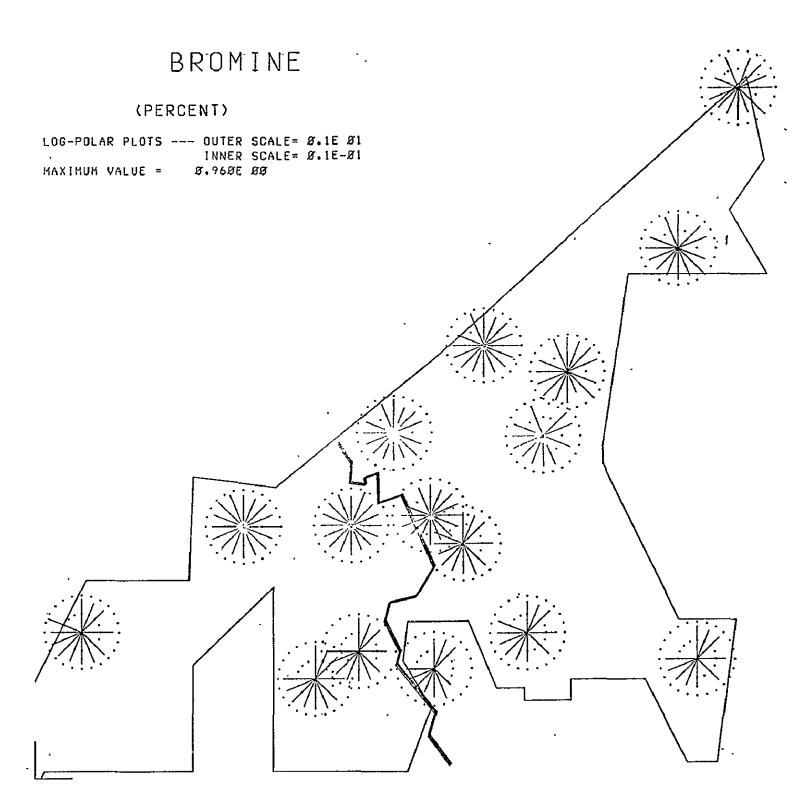


SELENIUM

(PERCENT) NUMBER OF READINGS

### WIND FROM

				N	NNE	NE	ENE	E	ESE	SE	SSE	s	SSW	SW	иѕи	W	MNM	NW	иии
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	1			1	1	6	4	1	1	2	5	5	2	6	4	7	3	Ø	4
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	4	**		Ø	Ø	2	1	Ø	2	Ø	1	1	2	5	4	6	2	Ø	3
	5,	-		3	3	5	ø	3	Ø	2	Ø	6	8	4	4	s	1	Ø	Ø
	6	-		1	Ø	5	2	Ø	i	1	1	1	1	5	4	5	1	Ø	2
	7	-		1	1	8	4	1	S	1	5	4	3	4	7	7	3	1	3
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	15			1	2	7	4	1	5	1	Ś	2	3	4	7	8	4	1	3
	17	-		i	1	7	4	ø	1	1 -	- 1	4	3	5	6	5	4	Ø	3
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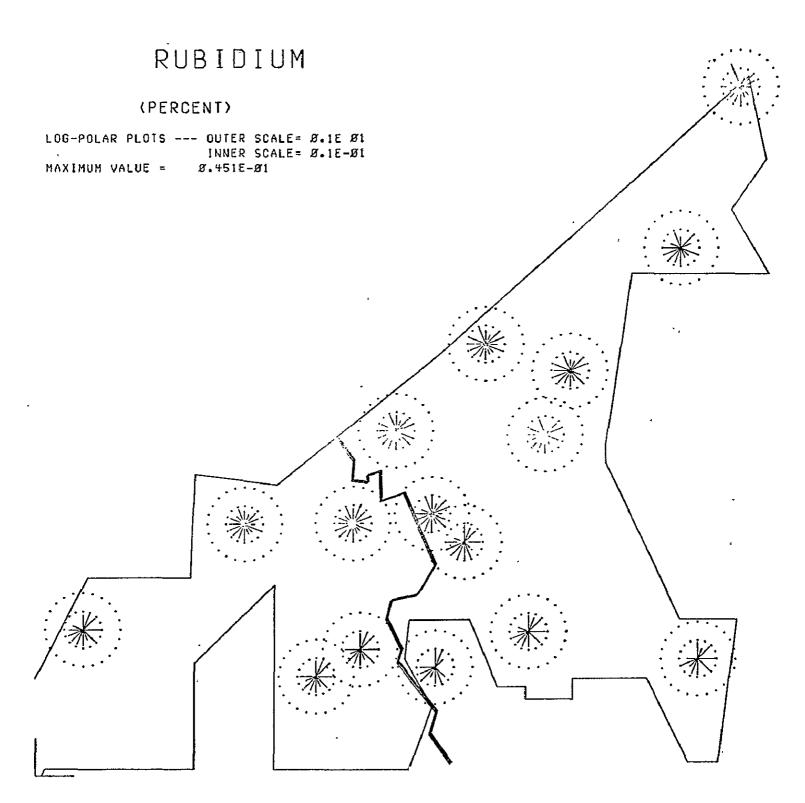
BROMINE

(PERCENT)

### NUMBER OF READINGS

NIND FROM

				N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	M	MNM	NW	NNW
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	3	-	3		3	4	Ø	3	Ø	2	3	9	11	6	. 5	4	Ø	Ø	ø.
	4	-	Ø		Ø	2	1	Ø	2	Ø	1	1	2	5	4	6	2	ø	3
	5	•	3		3	5	Ø	3	8	2	Ø	6	8	4	4	2	1	Ø	Ø
	6	**	1		Ø	5	3	Ø	5	1	1	1	1	5	4	5	1	Ø	3
	7	-	1		1	8	4	1	5	1	5	4	3	4	7	7	3	1	3
LLJ	8	-	3		3	4	Ø	3	Ø	2	3	9	18	6	4	2	Ø	Ø	ø
	9	-	3		2	4	Ø	3	B	1	5	8	9	4	5	4	1	Ø	Ø
S	18	•	1		1	8	3	1	2	.1	1	3	1	6	8	8	4	Ø	4
	12	-	3		3	4	Ø	3	Ø	2	3	8	11	6	з.	3 .	1	Ø	Ø
	13	••	3		4	1	Ø	Ø	Ø	1	1	4	, 7	3	4	4	Ø	Ø	Ø
-	14	-	3		1	4	ø	3	Ø	1	Ø	7	7	2	3	3	Ø	Ø	Ø
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RUBIDIUM

(PERCENT)

# NUMBER OF READINGS

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	3	-	3	2	2	Ø	3	Ø	1	<b>-1</b>	6	7	4	<b>-1</b>	2	Ø	Ø	Ø
	4	-	Ø	Ø	2	ı	Ø	2	Ø	-1	1	1	4	ś	3	1	Ø	3
	5	-	1	2	3	Ø	3	B	1	Ø	4	5	1	1	-1	-1	Ø	Ø
	6	-	-1	Ø	4	-1	Ø	1	-1	-1	I	1	2	1	2	-1	Ø	s
	7		1	-1	5	3	- i	2	- 1	-1	3	2	4	4	1	1	-1	3
1.1	. 8	-	3	1	5	ø	3	Ø	1	-1	. 6	7	4	-1	1	Ø	Ø	Ø
	9	-	1	i	3	Ø	3	Ø	-1	1	4	8	3	1	2	-1	Ø	Ø
ဟ	18	-	1	-1	6	2	-1	1	-1	- i	s	1	6	5	4	1	8	4
	- 12	-	s	1	2	Ø	3	Ø	1	-1	6	6	4	1	2	-1	Ø	Ø
	13		S	S	-1	Ø	Ø	ø	1	1	2	-1	1	1	1	Ø	Ø	ø
	14	•	2	-1	4	ø	3	ø	. 1	ø	<b>'</b> 5	6	<b>-1</b>	2	-1	Ø	Ø	Ø
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	17	-	1	-1	5	4	Ø	-1	. 4	-1	3	2	5	4	2	1	Ø	3
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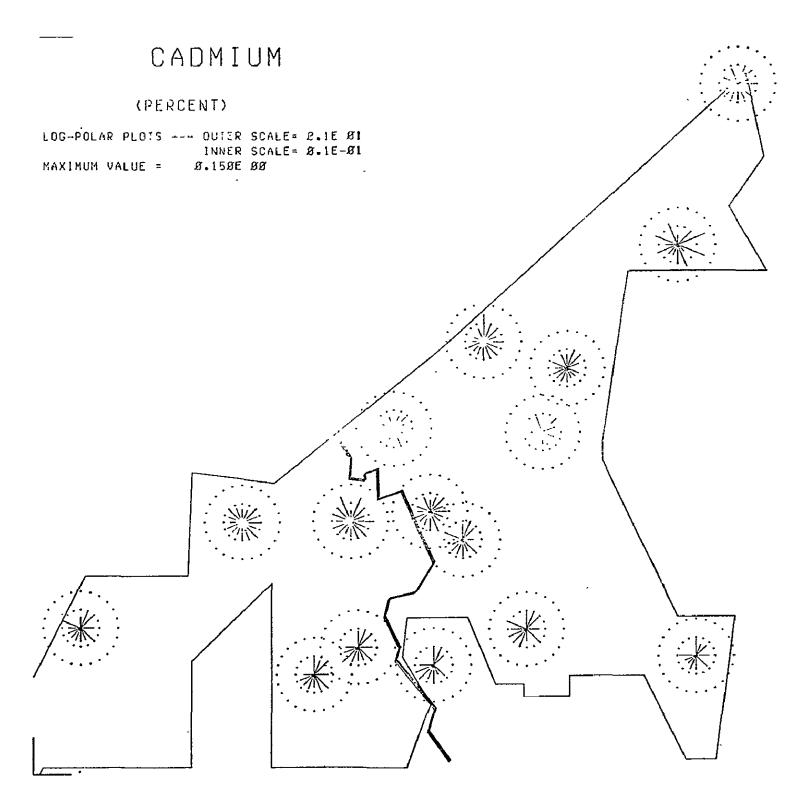
# SILVER - (PERCENT) LOG-POLAR PLOIS --- OUTER SCALE= 8.1E 88 INNER SCALE= 8.1E-82 MAXIMUM VALUE = 8.487E-82

SILVER

(PERCENT) NUMBER OF READINGS

KIND F.IM

ESE SE SSE S SSN SN 3 2 Ø 2 2 2 2 3 5 Ø Ø Ø Ø Ø 1 e Ø -1 -1 -- 1 - 1 1 Ē -1 3 2 5 S 2 -1 1 3 13 3 ß 2 1 2 Ø 12 2 Ø -1 Ø 3 Ø 13 **-** i 2 14 1 1 3 Ø 1 -1 -1 **- 1** 2 -1 ī 2 -1 1 15 2 2 1 Ø 2 SØ 3 -1 œ 1 5 2 8 3 2 3 Ø 3 . Ø

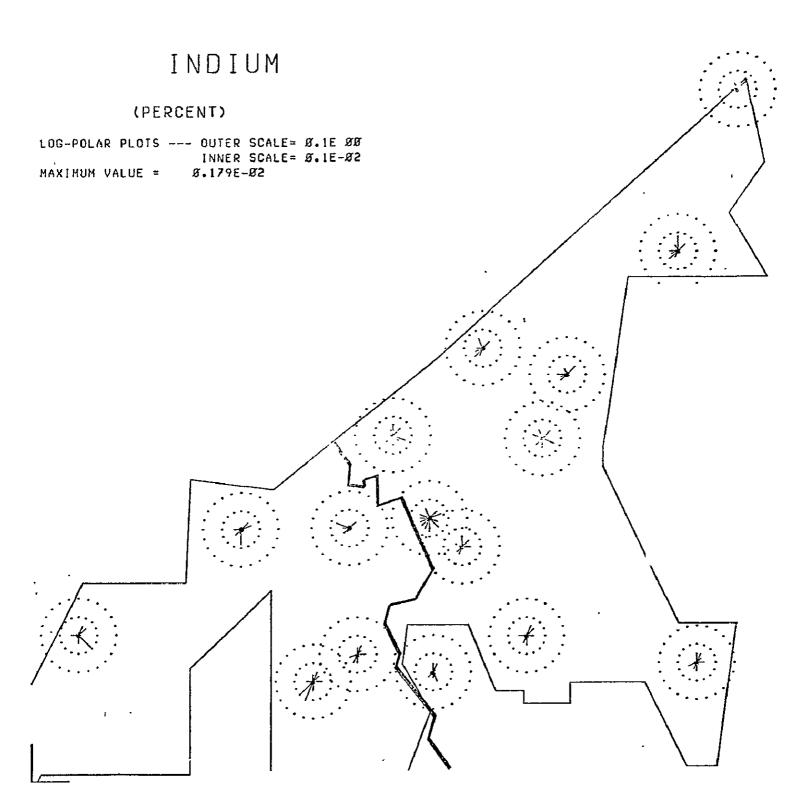


CADMIUM

(PERCENT) NUMBER OF READINGS

WORL Chil

NNE NE ENE E ESE SE SSE S SSW SH WSW ß . 8 ٠ø 1Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø B Ø ì 1Ø . 7 i Ø Ø Ø . 5 Ø ຸ 5 Ø Ø . 2 Ø Э



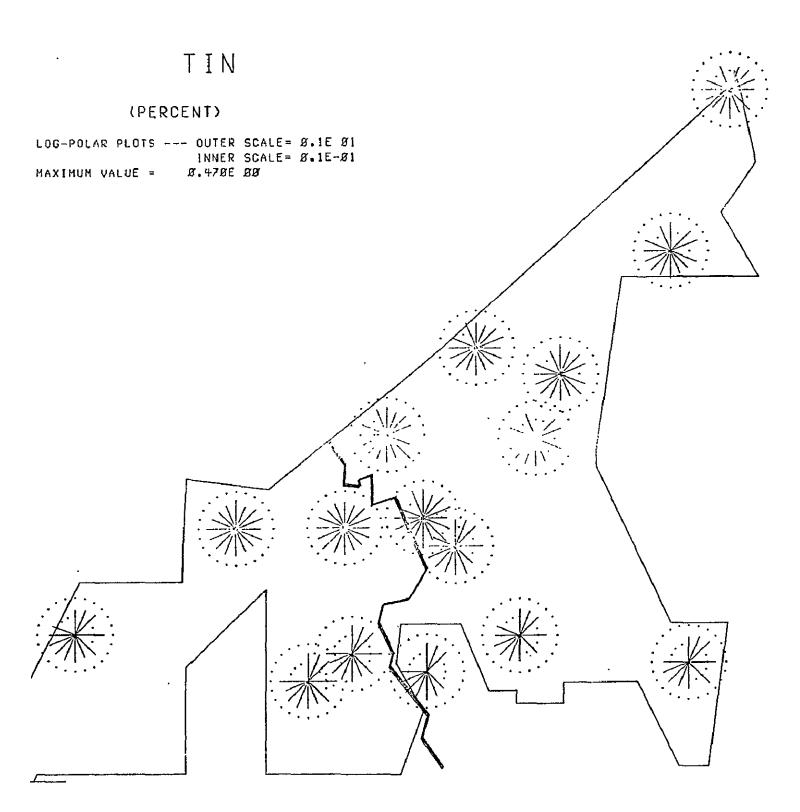
INDIUM

(PERCENT)

# NUMBER OF READINGS

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	5	•	<b>- 1</b>	1	1	Ø	1	Ø	<b>-1</b>	Ø	1	1	- 1	- 1	1	-1	Ø	Ø
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	12	-	-1	1	2	Ø	<b>- i</b>	Ø	1	-1	2	1	-1	-1	1	<b>- 1</b>	Ø	Ø
	13		1	3	<b>-1</b>	Ø	Ø	Ø	-1	1	2	2	1	1	-1	Ø	Ø	Ø
	14	•	1	1	2	Ø	1	Ø	-1	Ø	3	3	-1	2	-1	Ø	Ø	Ø
	15	-	-1	-1	3	-1	- i	-1	-1	-1	-1	1	2	-1	1	1	-1	-1
	17	-	-1	-1	4	-1	Ø	-1	-1	-1	-1	-1	1	5	3	<b>- 1</b>	Ø	1
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	21	-	1	-1	2	-1	Ø	1	1	-1	5	1	1	-1	1	- 1	Ø	ì



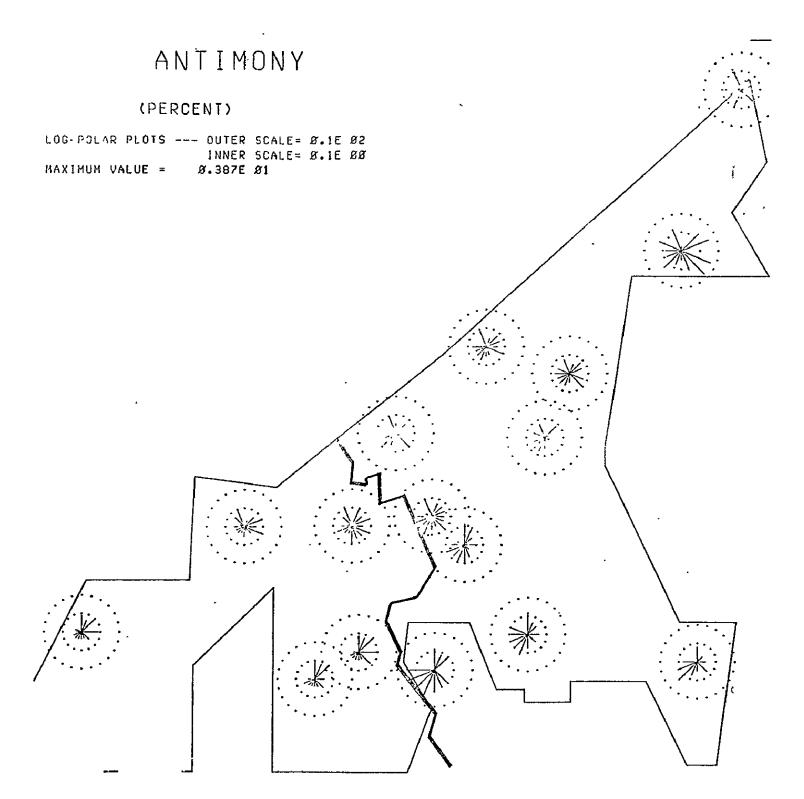
TIN

(PERCENT)

# NUMBER OF READINGS

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3	-		2	2	3	Ø	3	ø	1	-1	6	8	4	-1	2	ø	Ø	Ø
4			Ø	ø	2	1	Ø	s	Ø	-1	1	1	5	3	3	1	Ø	3
5	•••		2	. 2	3	Ø	2	Ø	1	Ø	4	6	2	1 -	- 1	-1	Ø	Ø
6	-		1	Ø	5	5	Ø	1	-1	-1	1	1	п	1	3	I	Ø	3
7	-		1	- <b>i</b>	£	Ġ.	- 1	5	-1	- 1	3	1	٦	i	ē	1 -	- 1	3
8	•		3	2	3	Ø	3	Ø	1	-1	6	6	4	-1	1	Ø	Ø	Ø
9			3	1	2	Ø	3	Ø	-1	i	5	8	3	s	2	-1	Ø	Ø
1.8	-		1	-1	6	3	-1	2	-1.	-1	s -	- 1	6	4	4	1	Ø	4
12	**		2	2	3	Ø	3	Ø	1	-1	6	7	4	1	2	-1	Ø	ø
13	-		2	3	1	ø	ø	ø	1	1	3	4	1	1	1	ø	Ø	Ø
14	4		3	1	3	Ø	3	À	1	Ø	6	6	1	3	1	Ø	Ø	Ø
15	•		i	-1	4	4	- 1	s	-1	-1	1	1	4	4	4	1 ~	- <b>i</b>	3
17	•		1	-1	5	4	ø	i	1	· <b>- 1</b>	3	1	5	4	3	1	Ø	3
S®	-		Ø	<b>-1</b>	4	2	-1	Ø	1	-1	1	1	2	s	3	- 1	Ø	S
21	-		1	-1	4	5	Ø	1	1	-1	3	1	3	2	3	1	Ø	3



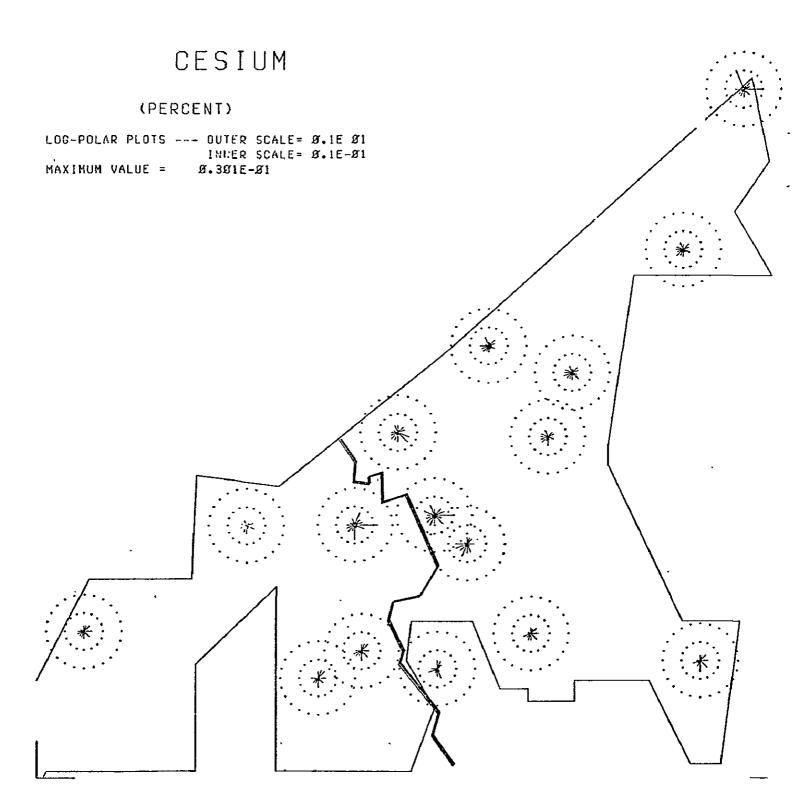
ANTIMONY

(PERCENT)

NUMBER OF READINGS

WIND FROM

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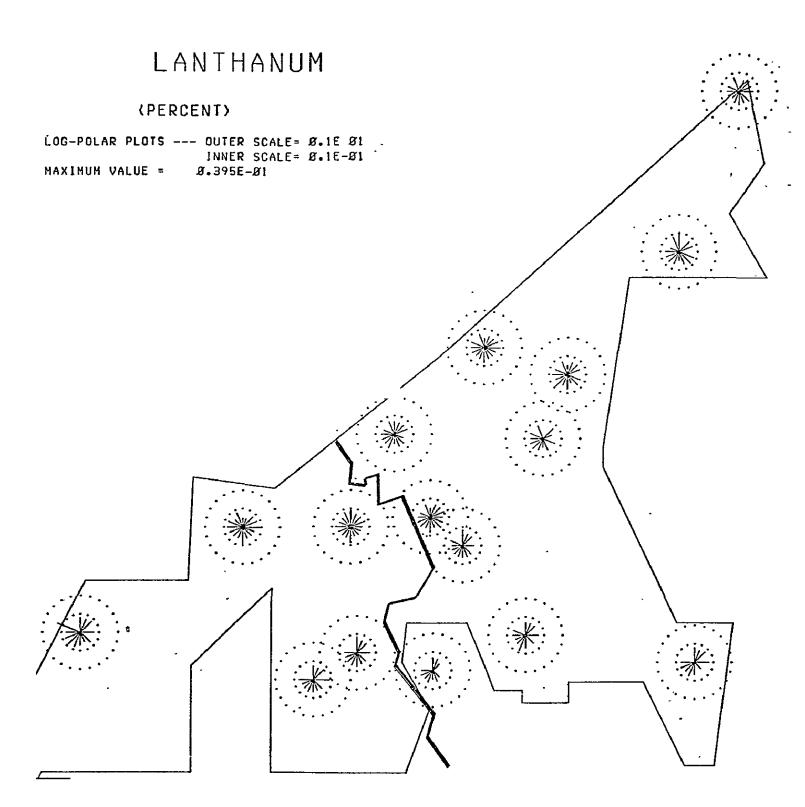


CESIUM

(PERCENT) NUMBER OF READINGS

WIND FROM

E ESE SE SSE NNE NE ENE SSW SW WSW W 5 3 Ø 3 3 5 3 3 2 Ø S 1 Ø 2 1 5 3 1 Ø 3 5 5 5 Ø 3 Ø Ø Ø 4 Ø Ø 5 Ø -1 3 5 5 3 -1 2 3 3 -1 1 Ø Ø Ø 5 3 3 2 1.0 -1 6 2 Ø 3 -1 12 3 13 3 3 1 Ø Ø i 3 3 -1 1 Ø Ø 4 3 14 3 Ø 3 Ø Ø 7 -1Ø И 2 15 5 1 3 5 17 Ø 1 3 Ø 2 3 ВS Ø 21 2 Ø 3 3 3 1 Ø



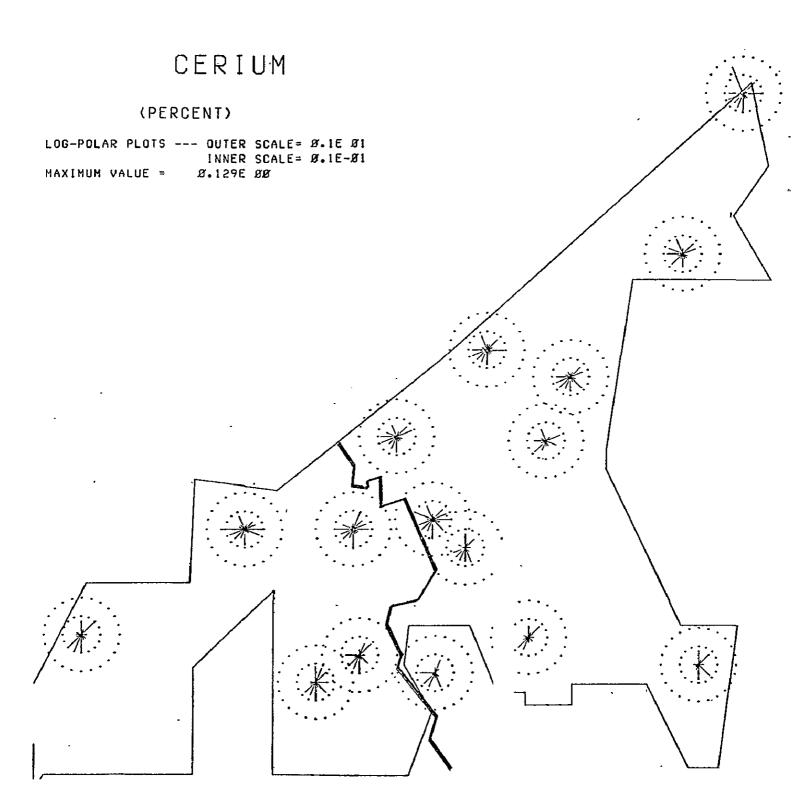
LANTHANUM

(PERCENT)

NUMBER OF READINGS

WIND FROM

ESE SE SSE S SSW SW WSW Ø Ø Ø Ø Ø Ø -1 Ø . 1 Ø Ø Ø Ø Ø Ø ø -1 - 1 Ø -1 Ø Ø Ø Ø Ø Ø -1 Ø Ø Ø Ø Ø Ø -1 Ø Ø -1 Ø Ø Ø Ø I 5. i -1 Ø **-** i . 1 Ø Ø Ø Ø . 2 -1 



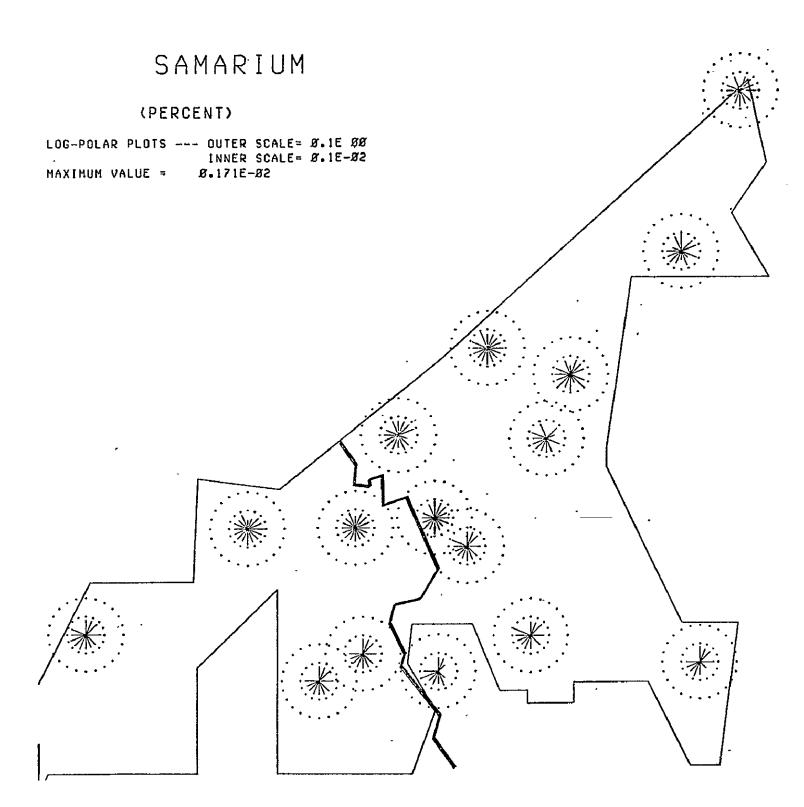
CERIUM

(PERCENT)

# NUMBER OF READINGS

### WIND FROM

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	1 -	-	-1	-1	2	1	1	-1	1	-1	1	1	3	2	-1	1	Ø	4
	3	••	-1	2	1	Ø	-1	Ø	1	-1	1	5	2	-1	1	Ø	<b>8</b> .	Ø
	4		Ø	Ø	-1	1	Ø	1	Ø	-1	-1	1	2	-1	2	-1	Ø	2
	5	-	1	-1	1	Ø	-1	ø	-1	ø	-1	1	2	-1	-1	-1	ø	Ø
	6		-1	Ø	4	1	Ø	-1	-1	-1	1	-1	2	-1	2	1	Ø	1
	7	-	-1	-1	5	3	1	1	-1	-1	3	1	i	2	1	-1	-1	1
ш	8	-	1	2	2	Ø	1	Ø	1	-1	1	3	2	-1	-1	Ø	ø	Ø
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	12	-	2	-1	1	Ø	-1	ø	-1	<b>-1</b>	1	5	3	-1	-1	-1	Ø	Ø
	13	•	-1	1	-1	Ø	Ø	Ø	-1	1	-1	4	3	-1	2	ø	Ø	Ø
	14		2	-1	2	ø	-1	Ø	1	Ø	2	-1	-1	-1	-1	Ø	Ø	Ø
	15	<b>-</b> .	-1	1	4	5	1	-1	-1	-1	1	i	i	1	2	1	-1	-1
	17	-	-1	-1	5	i	Ø	- i	1	-1	2	2	1	2	i	-1	Ø	-1
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	21	10	Ø	-1	2	1	Ø	-1	-1	-1	i	1	1	1	1	1	Ø	1
-1	INDICAT	ES	ESTI	MATE	D VAL	υE		-		•								

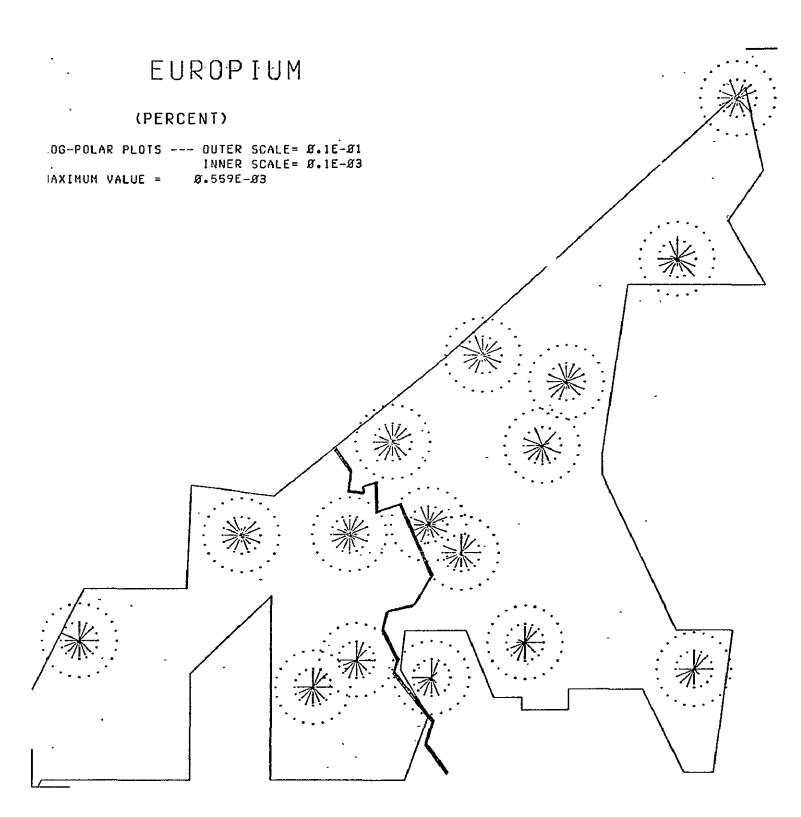


SAMARIUM

(PERCENT) NUMBER OF READINGS

#### WIND FROM

NNE NE ESE SE SSE S SSW SW WSW WNW NW Ø Ø Ø Ø Ø Ø Ø ø -1 Ø Ø Ø Ø Ø Ø Ø Ø -1 -1 -1 Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø i Ø Ø Ø Ø g Ø Ø Ø -1Ø -1 Ø Ø -1 Ø Ø Ø Ø i Ø -1 Ø - 1 SB Ø Ø S ı S Ø ε. S Ø -1 

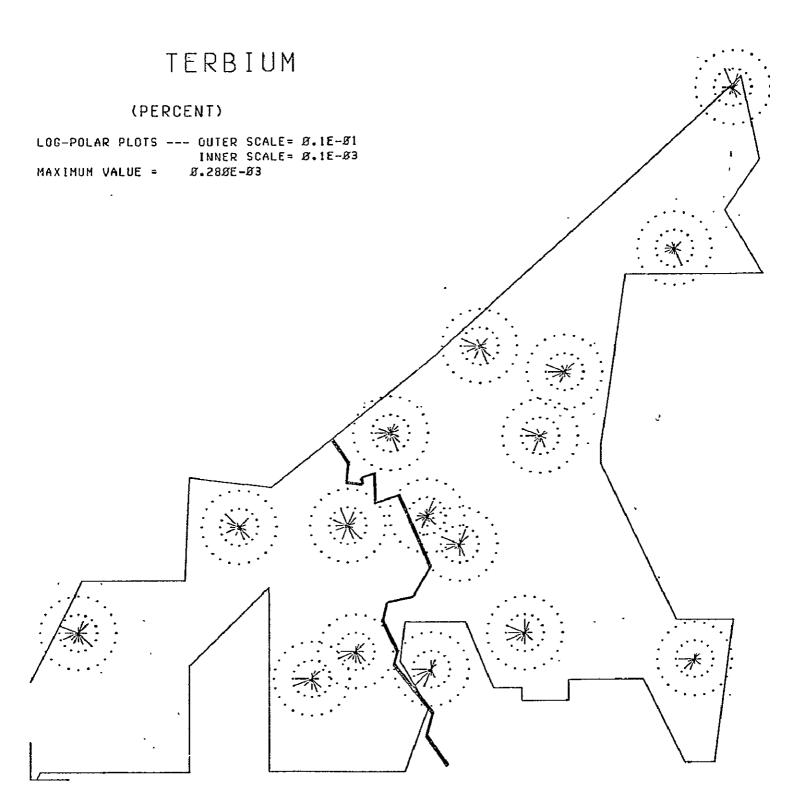


EUROPIUM

(PERCENT) NUMBER OF READINGS

WIND FROM

ESE SE SSE S SSW SW 2 3 3 3 5 3 Ø Ø Ø Ø 3 Ø Ø 2 3 Ø 3 Ø Ø 5 3 2 Ø Ø Ø 3 3 Ø 3 Ø 3 -1 1 2 -1 3 1 5 2 Ø Ø 3 6 3 Ø 2 3 Ø 3 2 2 Ø 3 Ø Ø 10 5 12 2 3 3 Ø 3 1 3 Ø 13 **-1** 14 2 i 3 Ø 3 -1 3 \$ 3 3 Ø 15 S 7 3 -1 3 4 5 3 -1 S 17 6 3 Ø 1 28 Ø 5 -1 Ø 2 2. 1 2 Ø 2 21 2 5 Ø 2

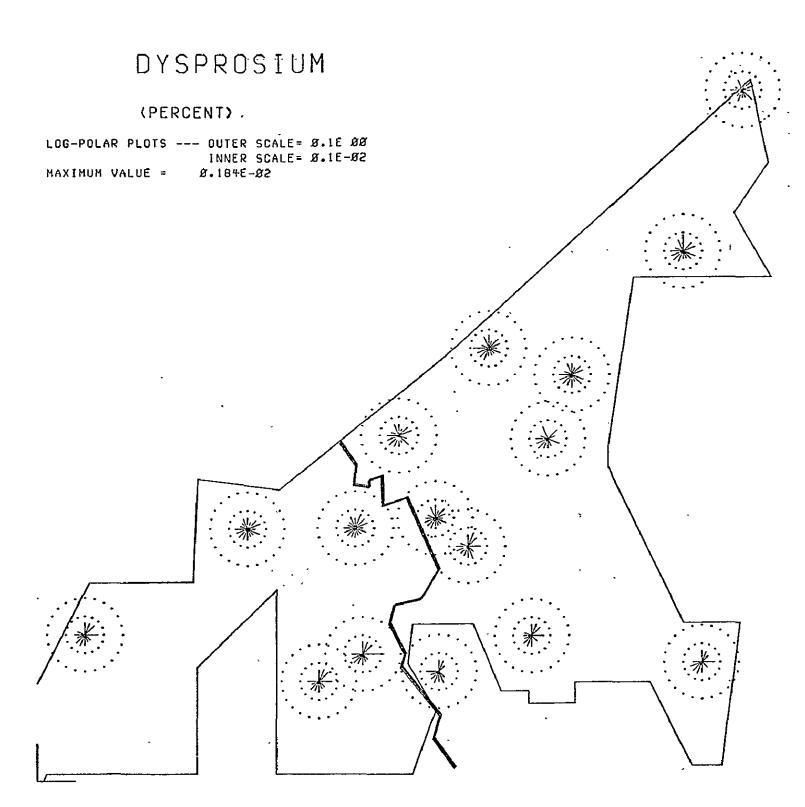


TERBIUM

# (PERCENT) NUMBER OF READINGS

### WIND FROM

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	1	-	1	1	5	4	- 1	-1	2	1	i	i	6	4	6	i	Ø	4
	3	-	2	2	3	Ø	2	Ø	2	2	8	8	6	4	3	Ø	ø	Ø
	4		Ø	Ø	2	1	Ø	2	Ø	1	1	2	5	3	6	2	Ø	3
	5	-	3	3	4	Ø	3	Ø	2	Ø	5	7	3	2	2	1	Ø	Ø
	6		1	Ø	3	-1	Ø	1	-1	1	1	1	4	4	4	i	Ø	2
	7		1	-1	8	4	-1	. 5	1	2	.3	2	4	6	5	2	1	2
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	12		s	3	3	ø	3	Ø	5	3	7	1.28	5	2	1	1	Ø	Ø
	13	•	5	4	1	Ø	Ø	Ø	-1	1	3	5	1	2	3	Ø	Ø	Ø
	14	₩.	3	1	4	ø	2	Ø	1	Ø	5	4	1	1	2	Ø	Ø	Ø
	15	•	1	1	7	4	-1	2	1	S	-1	1	3	5	8	2	<b>-1</b>	5
	17	*	-1	1	7	4	Ø	1	1	-1	3	3	5	6	5	4	Ø	3
	sø	-	ø	1	4	2	-1	Ø	2	i	2	1	2	3	1	-1	Ø	4
	21	•	1	1	6	s	Ø	1,	5	s.	3	5	3	6	5	^ <del>4</del>	Ø	3

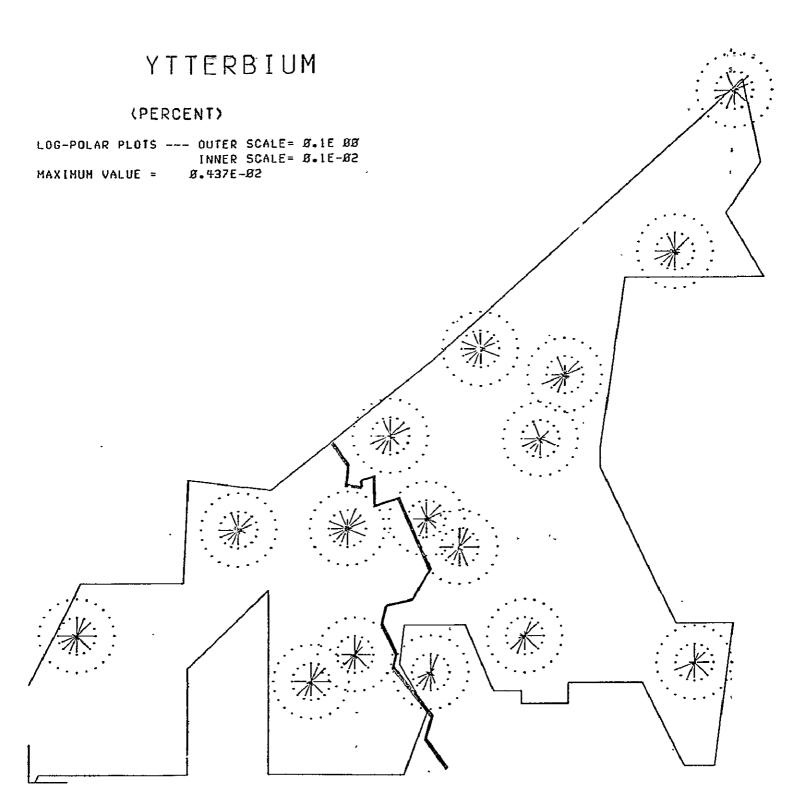


DYSPROSIUM

(PERCENT) NUMBER OF READINGS

WIND FROM

NNE NE ENE E ESE SE SSE S SSW SW WSW HNH NH 3 5 3 2 Ø 3 Ø 3 ż 3 Ø -1 3 Ø 3 -1 Ø 2 3 Ø 3 Ø -1 Ø 2 3 Ø 3 -1 -1 1 2 3 - 1 Ø Ø i 5 -1 3 -1 -1 3 2 2 3 3 5 - **i** 8 Ø Ø Ø Ø -1 3 3 2 3 5 5 -1 Ø Ø Ø Ø 5 18 -1 -1 Ø Ø 12 3 2 2 Ø 3 Ø 6. 2 Ø Ø 13 ·B Ø 14 S 3 Ø 3 Ø 3 3 Ø Ø 3 -1 3 15 i 5 3 -- 1 -1 -1 1 -- 1 3 17 Ø 2 Ø 2 -1 Ø **- 1** -1 5 S 3 Ø 2Ø 2 3 . 2 3 -11



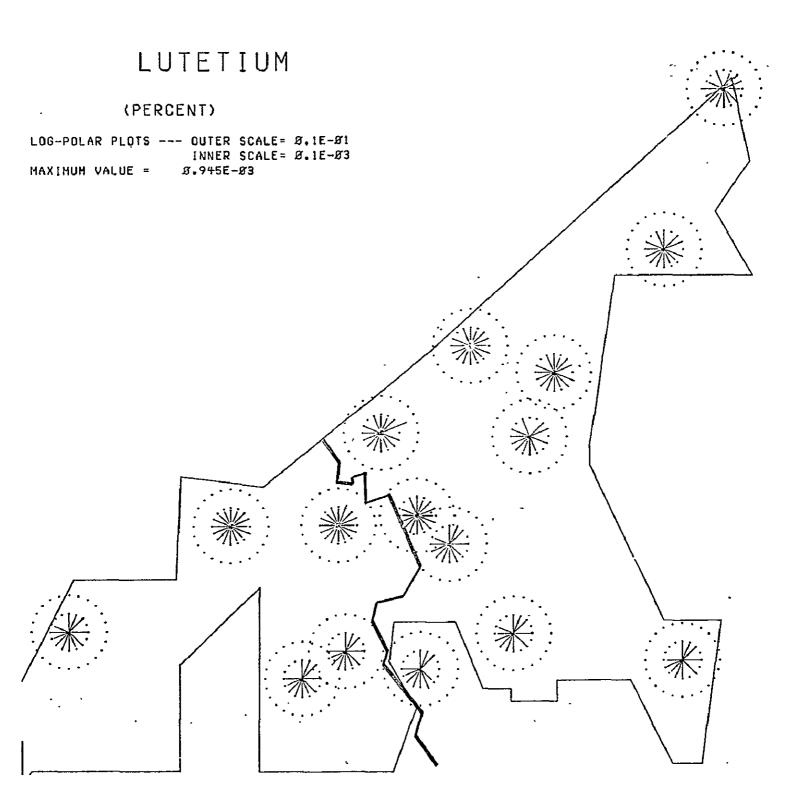
#### YTTERBIUM

(PERCENT)

## NUMBER OF READINGS

### . WIND FROM

			N	NNE	NE.	ΕN	E E	ESE	S S E	SSE	S	รรผ	รพ	WSW	H	พพพ	NW	พพพ
					-				•		• •		• •	<b>**</b> **				-
	1	••	1	-1	4	4	-1	1	ī	-1	1	2	4	- 1	1	-1	ø	3
	3	_	3	2	2	Ø	3	Ø	1.	-1	6	7	4	-1	2	Ø	Ø	Ø
	4		Ø	Ø	i	-1	Ø	5	ø	-1	1	i	4	3	3	-1	Ø	3
	5	•	-1	2	2	Ø	2	Ø	1	Ø	4	4	5 .	1	- i	-1	Ø	ø
	٠ 6	•	1	Ø	2	-1	Ø	-1	-1	-1	1	1	3	1	2	-1	Ø	2
	7	-	1	-1	5	3	-1	1	-1	-1	2	2	3	5	3	-1	- <b>1</b>	3
1.1	8	-	1	2	3	Ø	3	Ø	1	-1	6	5	4	- i	1	Ø	Ø	ø
ITE	. 9	-	2	1	2	Ø	3	Ø	-1	1	5	5	1	-1	2	-1	Ø	Ø
Ş	1.87	•	1	-1	4	3	-1	ź	-1	<b>-1</b>	2	1	5	5	4	1	Ø	4
	12		1	2	2	Ø	3	Ø	1	-1	6	5	3	1	2	-1	Ø	Ø
	13	-	3	5	-1	Ø	Ø	Ø	-1	1	3	3	1	1	1	ø	Ø	Ø
	14	-	3	1	2	Ø	3	Ø	1	Ø	6	4 -	-1	2	-1	8	Ø	Ø
	15	-	1	1	5	3	-1	2	-1	-1	1	5	3	4	4	1 -	- 1	3
	17	•	i	-1	3	3	Ø	-1	-1	-1	2	2	5	3	2	-1	Ø	3
	5 <b>&amp;</b>	•	Ø	-1	3	2	-1	Ø	1	-1	2	1 -	- i	s	5	-1	Ø	2
	21		1	-1	5	2	Ø	-1	1	-1	2	2	2	1	3	-1	Ø	3

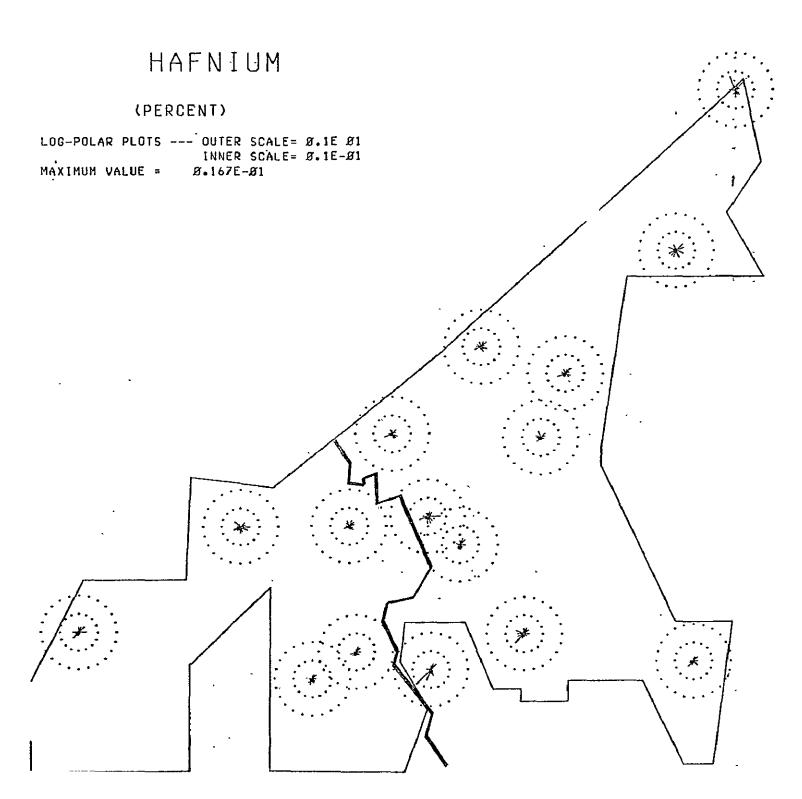


LUTETIUM

(PERCENT) NUMBER OF READINGS

#### WIND FROM

NNE NE ENE E ESE SE SSE S SSH SH WSW W 1 -1 1 2 -1 5 3 2 2 Ø Ø 2 Ø -1 -1 3 -1 3 -1 2 2 3 -1 2 -1 Ø 3 5 Ø 10 --1 3 -1 2 -1 2 Ø -1 12 -2 -1 13 3 Ø  $\mathbf{g}$ Ø 1 3 2 14 Ø 3 Ø Ø 15 -1 1 17 -1 Ø -1 3 5 3 Ø 3 2 5 2 28 -1 Ø -1 2 -1 9 2 2 21 **ø** : 1 1 -1 3 S

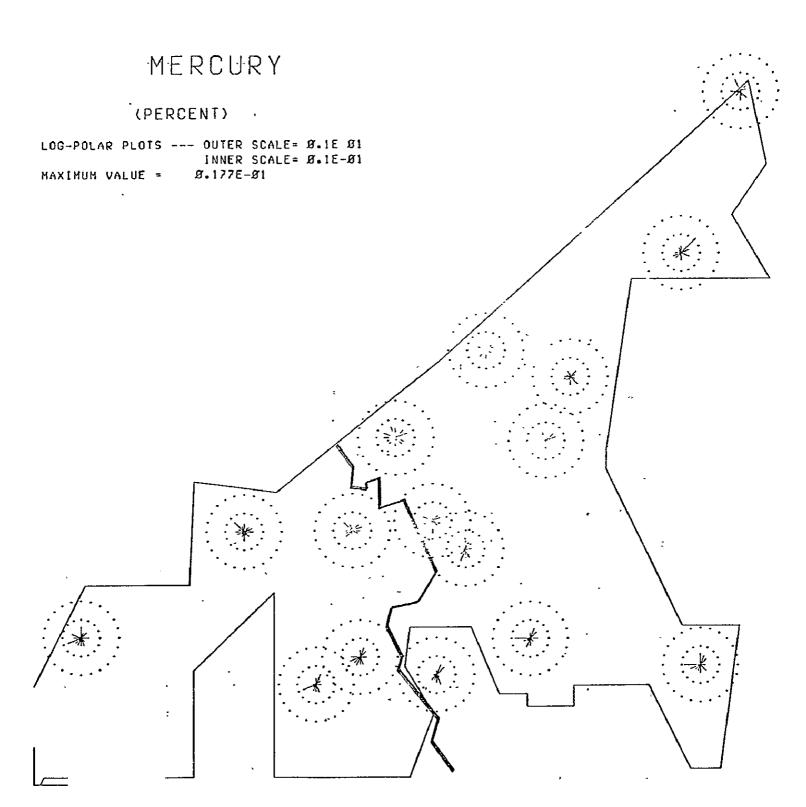


HAFNIUM

(PERCENT) NUMBER OF READINGS

#### VIND FROM

			N	NNE	NE	ENE	٤	ESE	· SE	SSE	S	SSH	รผ	พรพ	W	MNM	NH	NNW
	••••	· · · · ·	•• ••	** **										•		<b>-</b>		
	1		1	1	6	4	1	1.	5	s	2	5	6	3	7	2	Ø	4
	3	-	3	3	4	Ø	3	B.	5	3	9	11	6	5	4	æ	Ø	Ø
	4	-	Ø	Ø	2	1	ø	2	Ø	1	i	· 2	5	4	6	2	Ø	3
	5	•	3	3	5	ø	3	ø	2	Ø	6	7	4	4	2	1	Ø	B
	6	-	1	Ø	5	2	Ø	1 .	- 1	1	I	1	4	4	5	1	Ø	3
	7	•	1	i	7	4	1	2	1	s	4	3	4	7	6	3	1	3
1. 1	8	•	3	3	4	Ø	3	Ø	s	3	9	8	5	3	2	Ø	ø	Ø
1 1 1	9	-	3	2	4	Ø	3	Ø	1	2	8	8	4	5	4	1	Ø	Ø
ഗ	18	-	1	1	8	3 -	-1	2	1	1	2	1	6	8	8	4	Ø	4
	12	<b>~</b>	3	3	4	Ø	3 .	Ø	2	s	7	11	5	3	3	1	Ø	Ø
	13	-	3	4	1	Ø	Ø	Ø	1	1.	3	3	1	1	1	Ø	Ø	Ø
	14	-	3	1	4	Ø	3	Ø	1	Ø	7	6	2	3	3	Ø	Ø	Ø
	15	••	1	i	7	4 .	-1	s .	1	s	i	3	4	6	8	4	1	2
	17	•	1	1	7	4	Ø	1	1 -	- 1	3	3	5	6	5	4	Ø	3
	2 <b>&amp;</b>	••	B	ì	6	2	-1	Ø	2	s	3	1	2	4	#	5	Ø	4
	21	-	1	ì	7	2	ø	1	г,	2	3	2	3	6	5	4	Ø	3

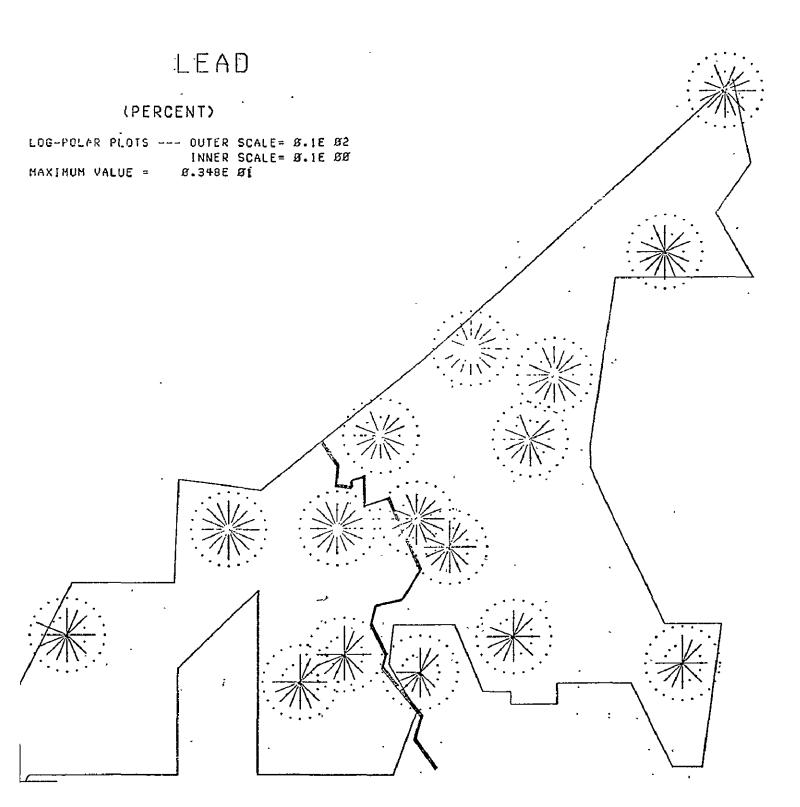


**MERCURY** 

(PERCENT) NUMBER OF READINGS

#### - WIND FROM

ENE E ESE SE SSE S SSN SN WSH W -1 1 -1 B Ø Ø Ø Ø Ø Ø Ø Ø S Ø Ø Ø 1-Ø 1 -1 . 5 Ø -1 ø Ø Ø Ø -1 B - ] Ø Ø Ø Ø Ø Ø Ø Ø .Ø Ø Ø -1 -1 -1 Ø Ø Ø 



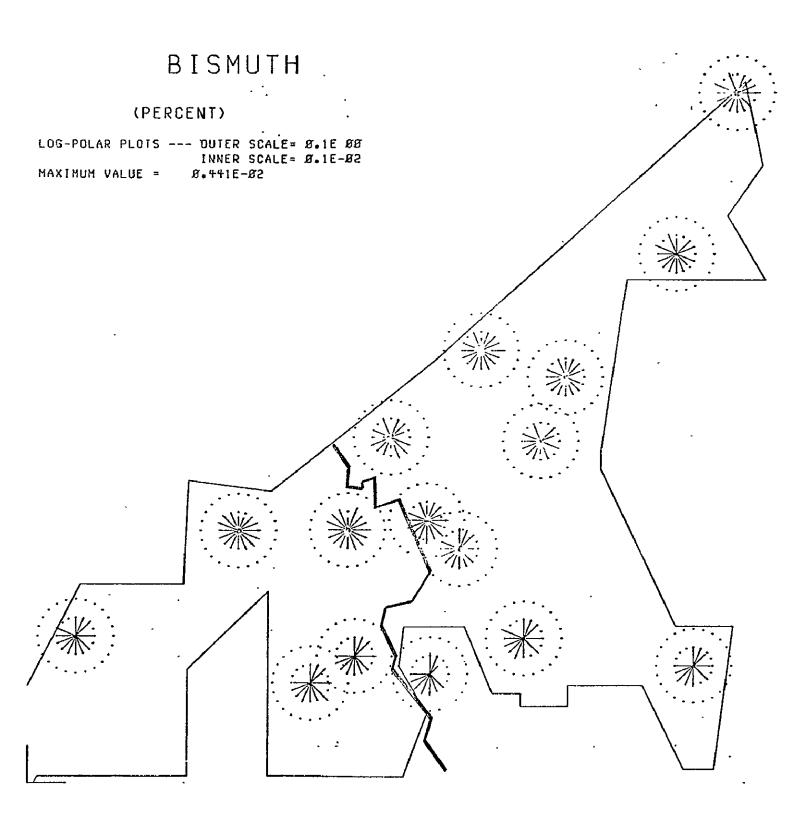
LEAD

· (PERCENT)

## NUMBER OF READINGS

#### KIND FROM

			N	NNE	NE	ENE	Ε	ESE	SE	SSE	S	SSW	SW	พรพ	M	иии	ИН	иии
					- 4	**												-
	1		1	1	6	4	1	1	2	3	2	2	6	4	7	3	Ø	5
	3	•	4	3	4	8	3	Ø	2	3	18 1	1	6	5	4	3	23	Ø
	4	•	Ø	B	5	i	Ø	s	Ø	1	1	2	5	4	6	2	Ø	3
	5	-	3	3	5	Ø.	3	ø	2	Ø	6	8	4	4	2	1	Ø	Ø
	6	•	i	Ø	5	3	Ø	2	1	2	ī	1	5	4	5	1	Ø	3
	7	-	1	1	8	4	1	5	1	3	4	3	4	7	7	3	1	4
ш	8	**	3	3	4	Ø	3	Ø	5	3	1Ø 1	Ø	6	3	2	Ø	Ø	Ø
H	9	-	4	2	4	Ø	3	Ø	1	5	8	9	4	5	4	1	Ø	Ø
S	10	•	1	1	8	3	1	5	1	5	3	1	6	8	7	4	Ø	5
	12	-	4	3	4	Ø	3	Ø	s	3	9 1	. 1	6	3	3	1	Ø	Ø
	13	-	3	4	1	Ø	Ø	Ø	1	1	4	7	4	4	4	Ø	Ø	Ø
	14	-	4	1	4	Ø	3	Ø	1	Ø	8	7	2	3	3	Ø	Ø	Ø
	15	-	1	2	7	4	1	5	1	3	5	3	4	7	8	4	1	4
	17	•	1	1	7	4	Ø	1.	1	1	4	3	5	6	5	4	Ø	3
	5 <b>&amp;</b>	<b>.</b>	Ø	1	6	2	1	Ø	2	3	3	2	5	4	5	2	Ø	5
	21	-	Ø	1	7	2	Ø	1	S	2	2	2	3	6	6	4	æ	3

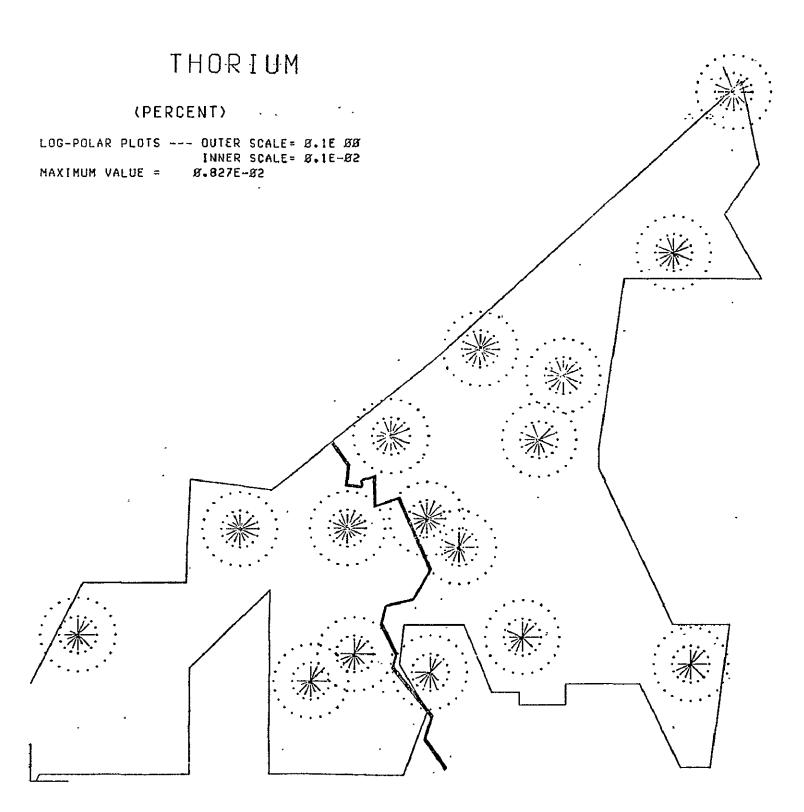


BISMUTH

# (PERCENT) NUMBER OF READINGS

MOND I COM

			N	NNE	NE	ENE	É	ESE	SE	SSE	S	SSW	SW	พรผ	М	мим	NW	NNH
•		• • • •														<b>.</b> .		•
	1	•	1	1	6	4	1	i	2	3	2	2 .	6	4	7	3	ø	5
	3	-	4 '.	3	4	Ø	3	Ø	2.	3	18	11	6	5	4	F	$\mathfrak{g}$	Ø
	4	•	a	Ø	з.	1	E	5	Ø	1	1	5	5	4	6	2	Ø	3
	5	#	3	ź	5	8	3	Ø	2	Ø	-6	8	4	4	2	1	Ø	Ø
	6		1	Ø	5	3	Ø	2	1	2	ī	1	5	4	5	1	Ø	3
	7	•.	1	1	8	4 .	ì	2	ì	3	4	3	4	7	7	3	1	4
ய	8	<b>**</b> ,	3	3	4	Ø	3	Ø	5	3	ıØ	10	6	3	2	Ø	Ø	Ø
<del></del>	9	-	4	2	4	Ø	3	Ø	1	'2	8 .	9	4	5	4	1	Ø	ø
·W	18	*	1	1	8	3	1	s	1	5	3	1	6	8	7	4	Ø	5
	12	-	4	3	4	Ø	3	Ø	S	3	9	11	6	3	3	1	Ø	Ø
	13	-	3	4	1	Ø	B	B	1	t	4	7	4	4	4	Ø	Ø	Ø
	14	-	4	1	4	Ø	3	Ø	i	Ø	7	7	5	3	3	Ø	Ø	ø
	15	-	1 .	5	7	4	1	2	1	3	5	3	4.	7	8	4	1	4
	17	-	1.	1	7	4	Ø	1	i	1	4	3	5	6	5	4	Ŕ	3
	28	-	Ø	1	6	2	1	Ø	г.	3	3	2	s	4	5	2	Ø	5
	21	-	Ø	1	7	2	Ø	1	2	S	2	2	3 ;	6	6	4	Ø	3



THORIUM

(PERCENT) NUMBER OF READINGS

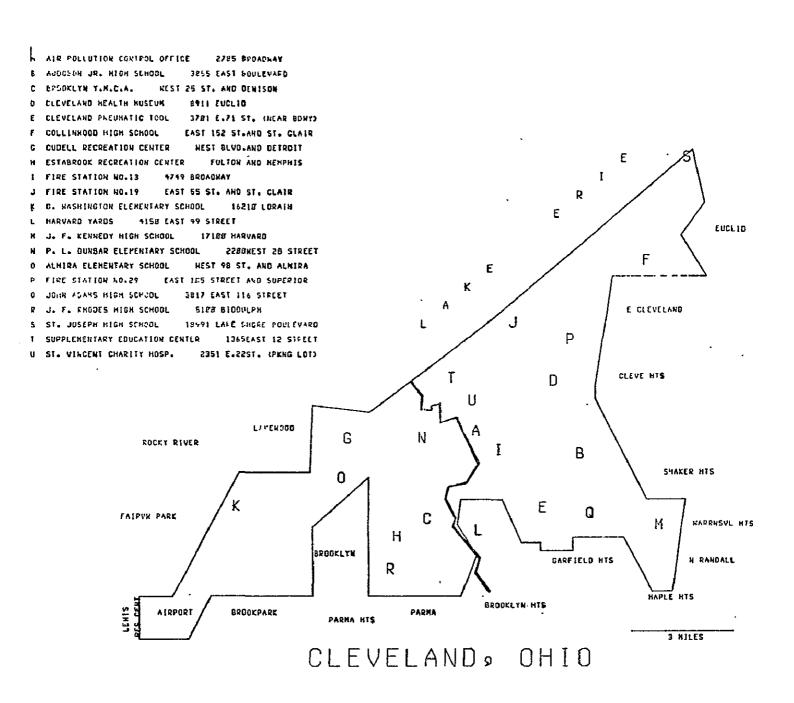
RIGHT LOOK

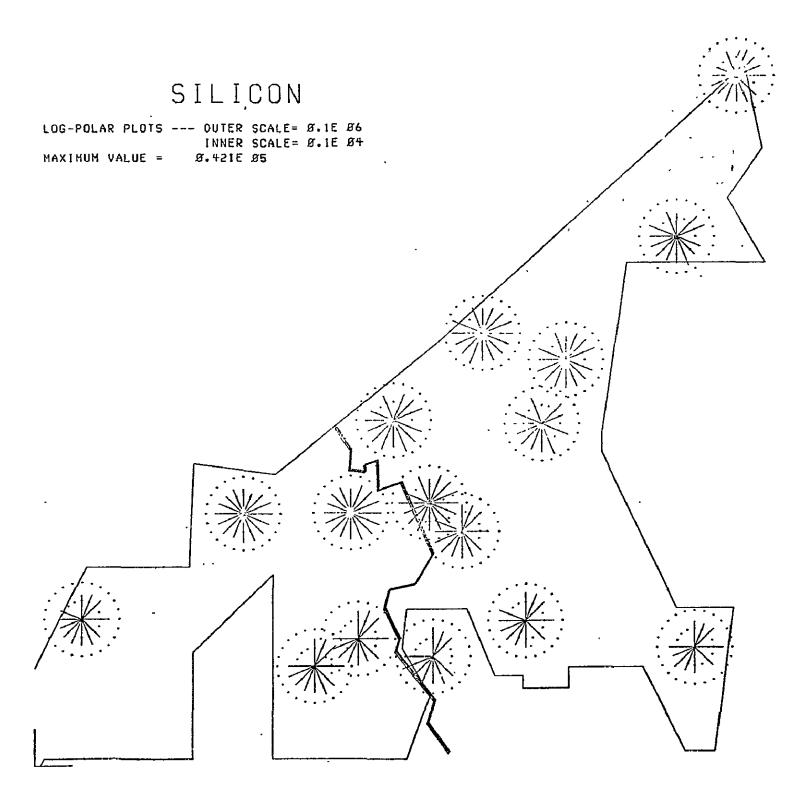
ENE E ESE SE STE S SSW SW WSW Ę ĉ . *g* ß Ø  $\mathfrak{g}$ g Ø  $\mathfrak{g}$ Ø ø. Ø Ø Ø Ç 7 . -S Ø. •4 Ø i Ø -1 Ø 5 , Ø **Ø** ۱,3 Ø Ø 

ECNEUSTE

15 OCT 1975

08021025



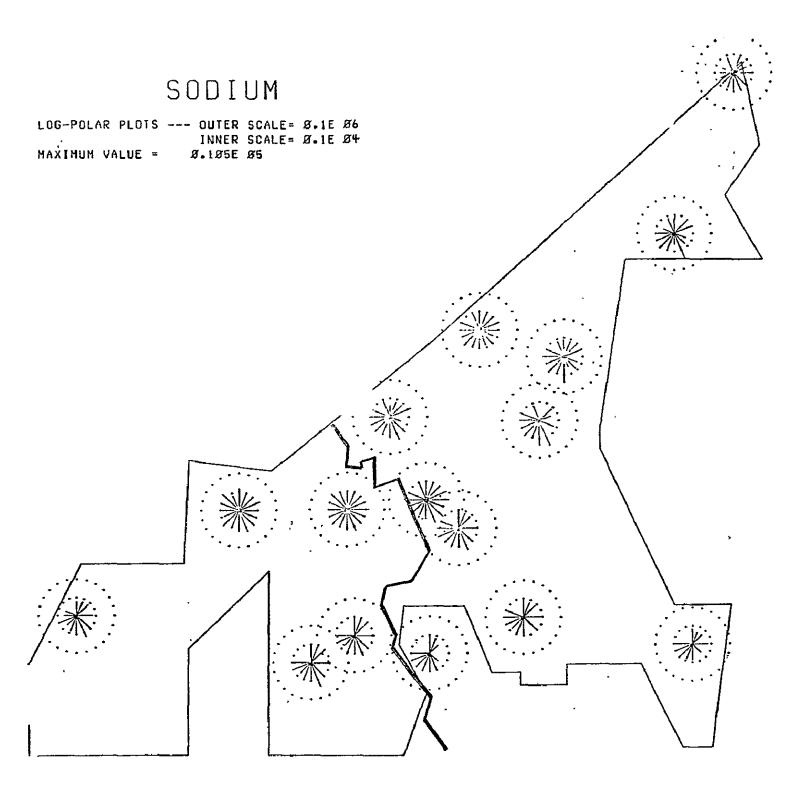


SILICON

### NUMBER OF READINGS

#### WIND FROM

			N	NNE	NE	ENE	Ε	ESE	SE	SSE	S	SSH	SW	изн	н	нин	NW	พพพ
		••• •														<b></b>		-
	1	~	1	1	6	4	1	1	2	3	2	S	Ĺ	4	7	3	ß	5
	3	-	4	3	4	Ø	3	B	2	3	1Ø 1	1	6	5	4	Ø	Ø	B
	4	-	Ø	Ø	2	1	Ø	5	æ	1	1	2	5	4	6	2	B	3
	5	•	3	3	5	Ø	3 .	Ø	2	Ø	6	8	4	4	2	1	Ø	Ø
	6	-	1	Ø	5	3	Ø	s	1	2	1	1	5	4	5	1	Ø	3
	7	**	1	1	8	4	1	2	1	3	4	3	4	7	7	3	i	4
ш	8	-	3	3	4	Ø	3	Ø .	2	3	1Ø 1	Ø	6	3	2	Ø	Ø	Ø
<b>⊢</b>	9	••	4	S	4	Ø	3	B	1	s	8	9	4	5	4	1	Ø	Ø
ဟ	18	•	1	1	8	3	1	5	1	5	3	1	6	8	7	4	Ø	5
	12	**	4	3	4	Ø	3	Ø	5	3	9 1	1	6	3	3	1	Ø	Ø
	13	4	3	4	1	Ø	Ø	Ø	i	1	4	7	4	4	4 .	Ø	Ø	Ø
•	14	-	4	1	4	Ø	3	ø	1	Ø	8	7	2	3	3	Ø	<b>Q</b>	Ø
	15	-	1	2	7	4	1	2	1	3	5	3	4	7	8	4	ţ	4
	17	•	1	1	7	4	Ø	1	1	1	4	<u>3</u>	5	6	5	4	æ	3
	SØ	•	8	1	6	5	1	ø	2	3	3	2	5	4	5	S	Ø	5
	21	•	Ø	1	7	2	Ø	1	2	2	2	2	4 .	6	6	4	Ø	3

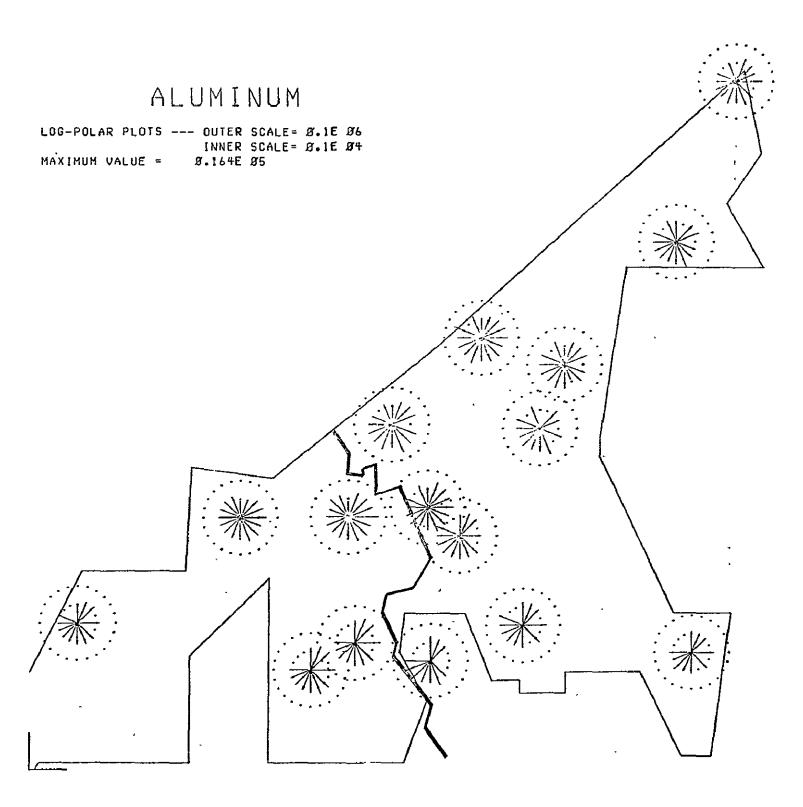


SODIUM

# NUMBER OF READINGS

#### HIND FROM

		N	NNE	NE ·	ENE	Ε	ESE	SE	SSE	S	SSW	SH	нѕи	H	нин	ни	NNH
`;	• • •															-	-
1	-	1	i	6	3	1	1	2	2	1	S	5	4	7	3	B	4
3	- •	3	3	3	ø	3	Ø	1	3	6	9	6	5	4	ø	Ø	B
4	-	Ø	B	s -	-1.	Ø	1	8	1	1	s	4	4	6	1	Ø	3
5	•	Ś	3	4	Ø	3	Ø	i	Ø	4	6	4	4	2	1	ø	Ø
6	-	1	Ø	4	3	Ø	1	1	1 -	- 1	1	4	4	5 -	-1	Ø	3
7	-	1,,	1	7	3	1	i	1	2	ş ,	3	3	7	7	5	1	3
8	-	3	3	3	Ø	3	Ø	1	3	6	8	6	4	s	Ø	Ø	Ø
9	٠ 🕳	3	. 2	3	Ø	3	Ø	1	2	5	7	4	5	4	1	Ø	Ø
10		1	1	7	3	1	·1	1	1	1	1	5	8	8	3	Ø	4
12		3	3	3	Ø	3	B	1	3	5	9	6	3	3	1	Ø	Ø
13	-	3	4 -	-1 ,	Ø	Ø	ø -	-1	1	2	6	4	4	4	Ø	Ø	Ø
14	-	5	1	3	Ø	3	ø -	- 1	Ø	4	5	2	3	3	Ø	Ø	Ø
15	**	1	s	7	3	1	1	1	5	2	3	4	7	8	3	1	3
17	•	1	1	6	3	ø	1	1 -	-1	2	3	4	6	5	3	Ø	3
Sã	•	Ø	1	6	2	r	Ø	5	5	1	2	ı	4	5	5	Ø	4
21	•	1	1	7	1	ø	-1	2	2	5	s	s	6	6	4	Ø	3

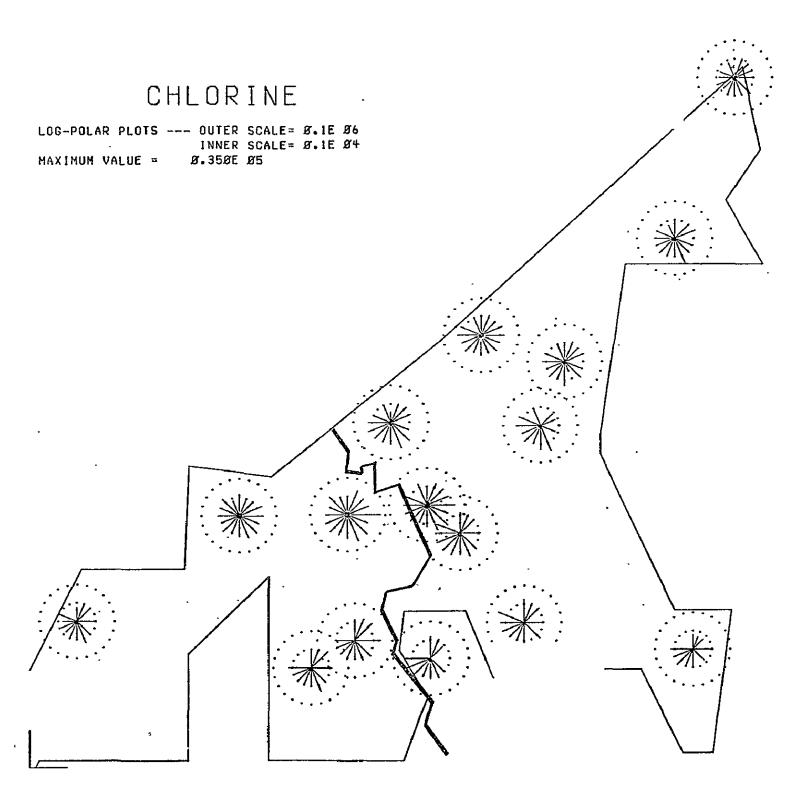


ALUMINUM

## NUMBER OF READINGS

### KIND FROM

		N	NNE	NE	ENE	Ε	ESE	SE	SSE	S	SSW	รผ	нѕи	W	мим	NW	иии
• • • • •	•••	++ M M			<b>-</b>				<b></b> ,								•
1	-	- 1	1	6	ı <del>ř</del>	1	1	2	5	2	2	6	4	7	3	B	4
3	•	3	3	4	Ø	3	Ø	2	3	9	1 1	6	5	4	Ø	B	Ø
4	-	E	Ø	s	1	Ø	2	Ø	1	1	5	5	4	6	2	ø	3
5	-	3	3	5	ø	3	Ø	2	ø	6	8	4	4	5	1	Ø	ø .
6	-	1	Ø	5	3	·8	2	i ·	1	I	1	5	4	5	1	ø.	3
7	•	i	1	8	4	ì	2	.1	2	4	3	4	7	7	3	1	3
8	••	3	3	4	Ø	3	Ø	2	3	9	1 <i>8</i>	6	4	2	Ø	Ø	Ø
9	•	3	5	4	Ø	3	B	1	2	8	9 '	4	5	4	i	Ø	Ø
18	-	1	1	8	3	1	. 2	1	1	3	i	6	8	7.	4	.ø	4
12	.=	3	3	4	8	3	Ø	2	3	8	1 1	6	3	3	i	B	Ø
13		· 3	<b>4</b>	1	Ø	ø .	B	1	1	4	7	4	4	4	Ø	Ø	Ø
14	•	3	1	4	ø	3	Ø	1	28	7	7	2	2	3	Ø	Ø	Ø
15	<b></b> ,	1	2	7	4	1	5	1,	2	2	3	4	7	8	4	1	3
17	•	1	1	7	4	Ø	1	1 -	-1	4	.3	5	6	5	4	Ø	3
5&	-	Ø	1	6	5	1	B	5	5	3	5	s	4	5	5	Ø	4
21	•	1	1	7	2	Ø	1 ·	2	2	3,	5	3	6	6	4	Ø	3

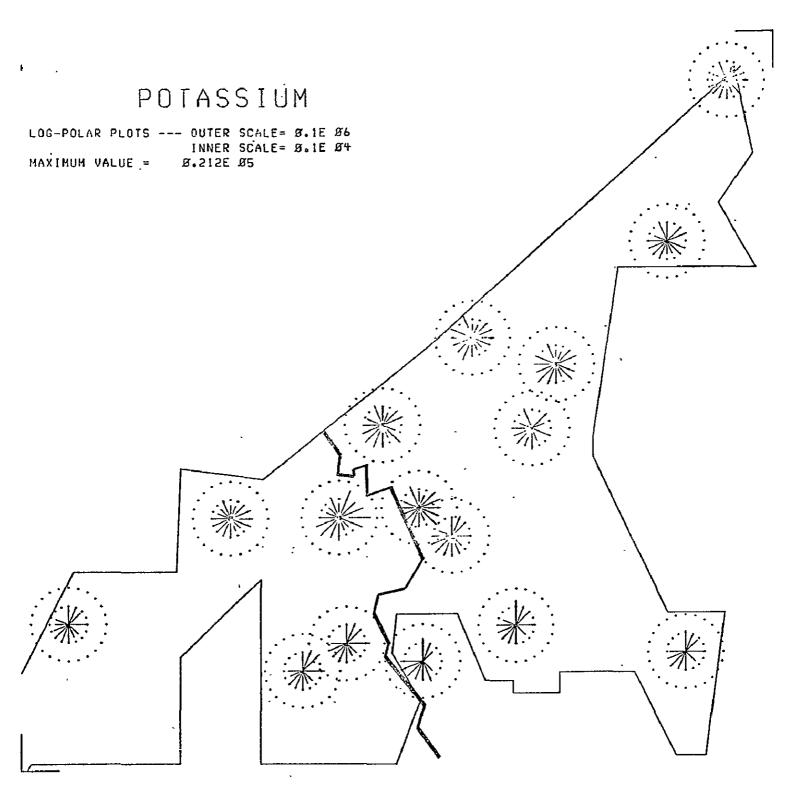


CHLORINE

## NUMBER OF READINGS

MOST ONES

			N	NNE	NE	ENE	£	ESE	SE	SSE	S	SSW	SW	иѕи	н	мим	NW	иин
	• • • • •	· · ·	 <b>-</b> -													4		-
	1	-	ì	1	6	4	1	1	2	S	2	5	6	4	7	3	3	4
	3	-	3	3	4	E	3	g	5	3	9	1 1	6	5	4	3	g	B
	4	-	B	2	5	1	B	2	Ŗ	1	1	S	5	4	6	2	E	3
	5	-	Ś	3	5	Ø	3	Ø	2	Ø	6	8	4	4	s	1	Ø	Ø
	6	-	1	Ø	5	3	Ø	2	1	1	1	1	5	4	5	I	Ø	3
	7	-	1	í	8	4	1	S	1	2	4	3	4	7	7	3	i	3
LJ	8	•	3	3	4	Ø	3	Ø	S	3	9	18	6	4	2	Ø	Ø	Ø
<del></del>	9	-	3	5	4	Ø	3	Ø	1	5	8	9	4	5	4	1	Ø	Ø
ഗ	18	•	1	1	8	3	1	2	1	1	3	1	6	8	8	4	B	4
	12	-	3	з.	4	Ø	3	Ø	2	3	8	1Ø	6	3	3	1	Ø	Ø
	13	••	3	4	1	Ø	Ø	Ø	i	t ·	4	7	4	4	4	Ø	Ø	Ø
	14	-	2	1	4	Ø	3	Ø	1	Ø	7	7	ż	3	3	Ø	Ø	Ø
	15	-	1	2	7	4	1	2	1	2	2	3	4	7	8	4	1	3
	17	-	1	1	7	4	Ø	1	<b>1</b> -	- 1	4	3	5	6	5	4	Ø	3
	28	-	Ø	1	6	2	1	Ø	2	5	3	5	2	4	5	5	Ø	4
	21	-	1	1	7	2	Ø	1	2	5	3	2	3	6	6	4	ø	3

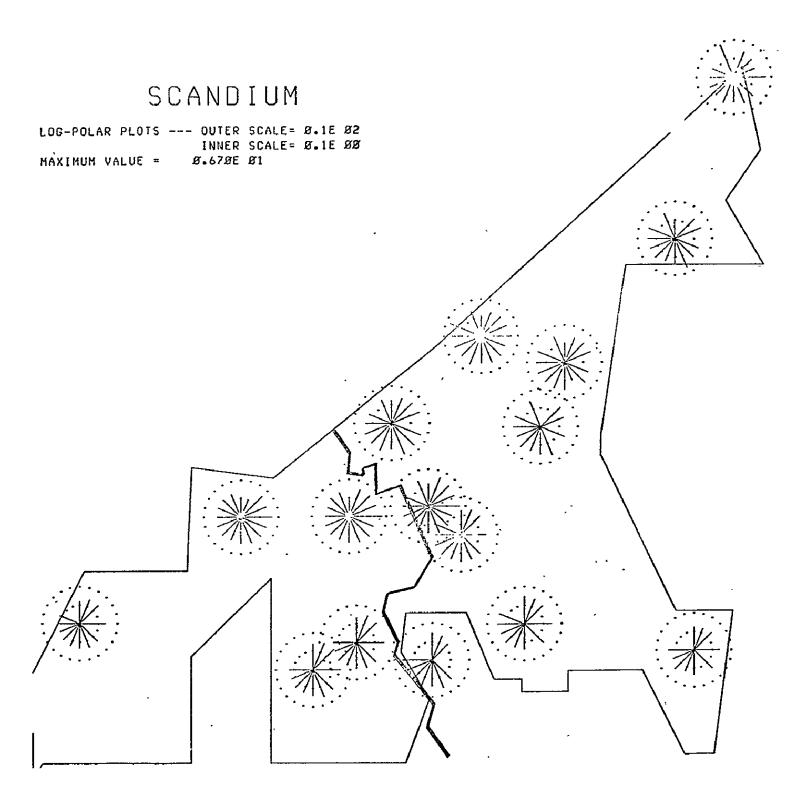


### POTASSIUM

## NUMBER OF READINGS

## . WIND FROM

				ии и	E NE	ENE	ε	ES	E S	E SS	E S	SSI	I SH	NSM	ł W	ı wn	W NW	NNW
		• • •		<b></b> .		4		• ••					ed 10		٠.		~	•
	ŧ	-	1	- i	4	3	1	i	1	-1	1	2	5	3	3	1	Ø	4
	3 .		3	5	5	Ø	3	Ø	-1	-1	4 `	7	5	1	2	B	Ø	8
	4	-	B	Ø	S	-1	Ø	1	ø	-1	1	1	4	3	· 3	-1	Ø	3 .
	5	-	5	2	3	Ø	3	Ø	-1	Ø	2	5	3	1	1	- <b>i</b>	Ø	B
	6	-	1	Ø	4	3	Ø	į	1	-1	-1	1	4	2	3	-1	B	3
	7	-	<del>-</del> 1	-1	5	3	1	1	<b>- i</b>	-1	S	2	3	5	3	-1	-1	3
ы	8	-	3	2	2	Ø	3	Ø	_ <b></b>	-1	4	6	5	- 1	1	Ø	Ø	Ø
<b>⊢</b>	9	-	3	1	5	Ø	3	Ø	-1	<b>'1</b>	3	7	3	2	3	-1	Ø	ø
S	18	-	1	-1	5	3	1	1	-1	-1	1	i	5	6	4	1	Ø	4
	12		3	2	2	Ø	3	Ø	-1	-1	4	7	5	1	3	-1	Ø	Ø
	13	•	3	3	-1	Ø	Ø	B	-1	i	2	5	4	1	3	Ø	Ø	Ø
	14	-	2	1	3	Ø	3	Ø	-1	Ø	4	4 .	1	3	2	Ø	Ø	Ø
	15	**	İ	1	5	3	1	1	-1	-1	2	. 2	4	5	3	<b>-1</b>	-1	3
	17	•	i	-1	4	3	Ø	1	1	-1	1	5	4	5	3	i	Ø	3
	2Ø	•	Ø	-1	4	2	1	Ø	1	·-1	1	2	1	3	3	1	Ø	4
	21	-	1	-1	4	1	Ø	-1	1	- <b>t</b>	1	S	s	3	2	1	Ø	3



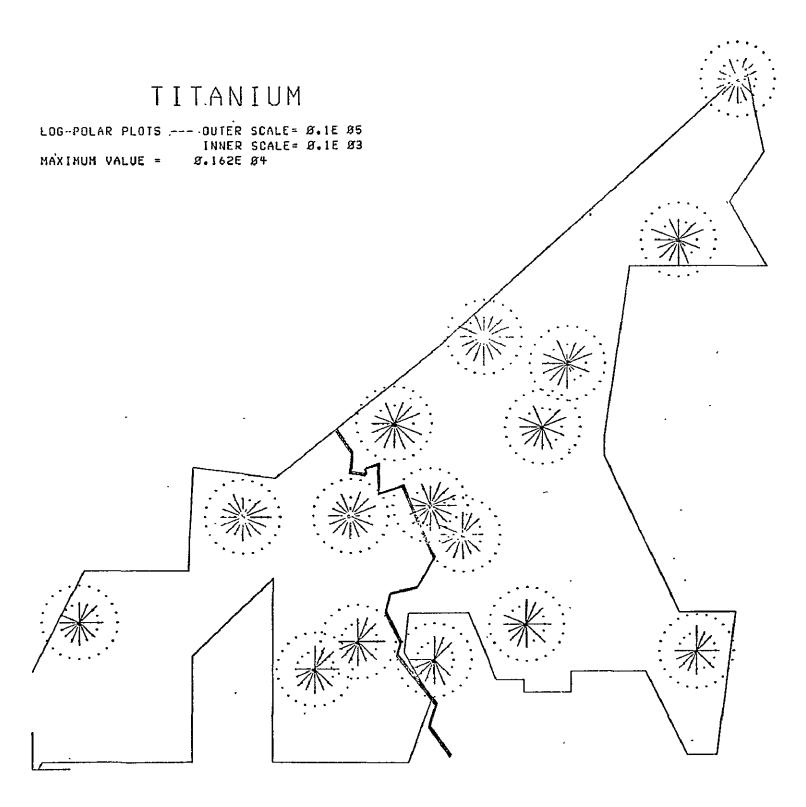
SCANDIUM

### NUMBER OF READINGS

MOST OFTH

				N	NNE	NE	ENE	Ε	ESE	SE	SSE	s	SSW	SW	พรพ	M	нин	NW	พทพ
	• • • • •	• • •	•	·		<b></b>				- `-									
	1	•		1	1	6	4	1	1	2	2	2	2	6	4	7	3	B	4
	3			3	3	4	Ø	3	Ø	2	3	9	11	6	5	4	В	Ø	B
	4			Ø	Ø	s	1	Ø	2	Ø	i	1	2	5	4	6	2	Ø	3
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	7	-		1	1	8	4	1	2	1	5	4	3	4	7	7	3	1	3
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<sup>-1</sup> INDICATES ESTIMATED VALUE

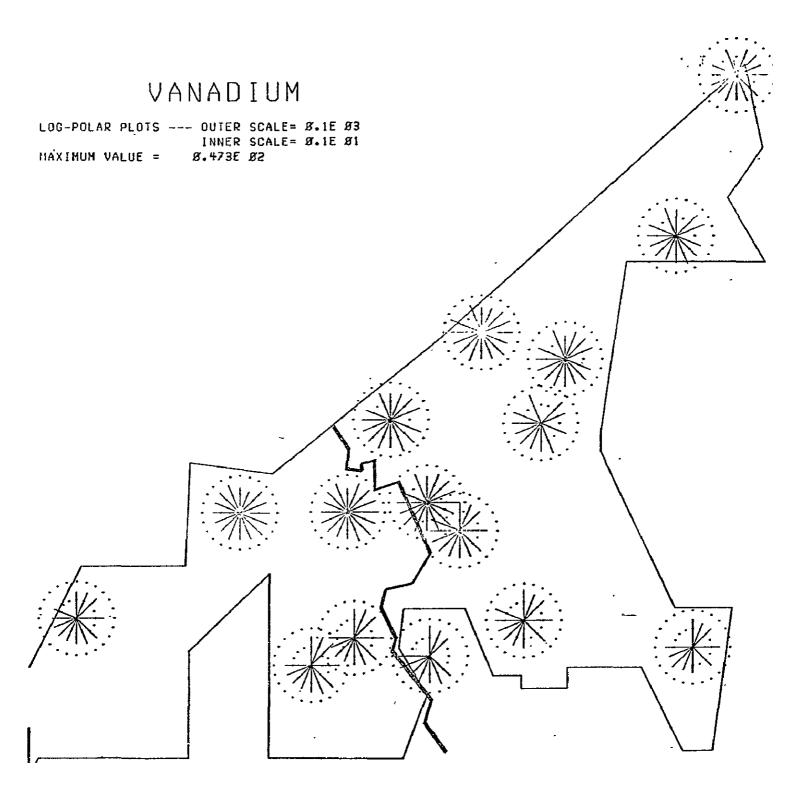


TITANIUM

# NUMBER OF READINGS

# HINO FROM

		Ŋ	NNE	NE	ENE	£	ESE	SE	SSE	S	SSW	SH	HSH	Н	МИМ	NW	чии
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7	-	1	1	8	4	1	2	1	2	3	2	3	7	6	3	1	2
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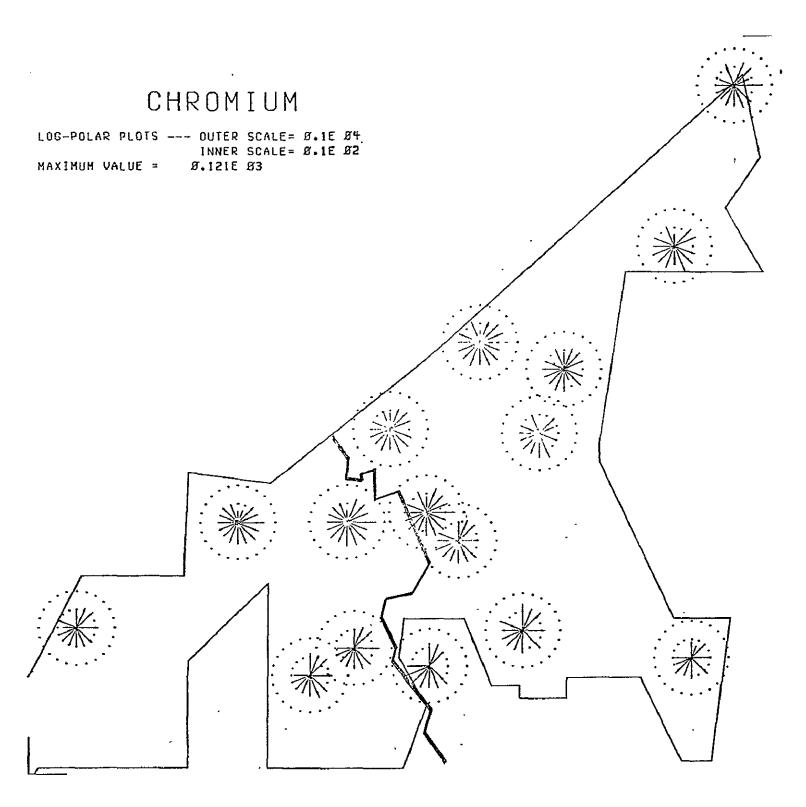


VANADIUM

### NUMBER OF READINGS

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	13	•	3	4	.1	Ø	Ø	ß	1	1	4	7	4	4	4	Ø	Ø	Ø
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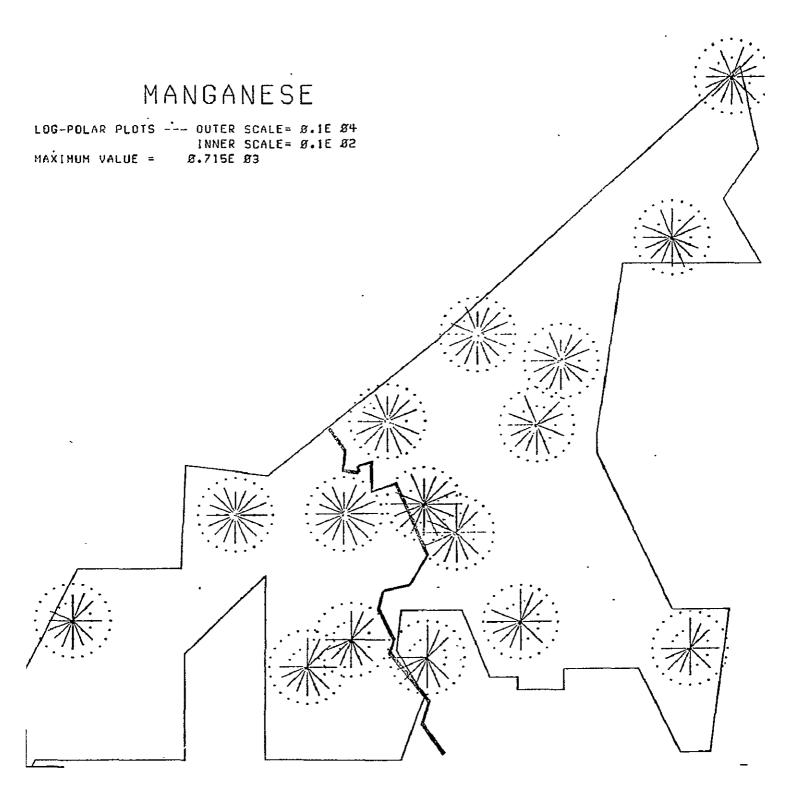


CHROMIUM

### NUMBER OF READINGS

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	5	•	3	3	5	Ø	3	Ø	2	Ø	6	8	4	4	2	1	Ø	Ø
	6	••	-1	Ø	5	3	Ø	2	1	1	1	1	5	4	5	1	Ø	3
	7	-	1	i	8	4	1	2	1	2	4	3	4	7	7	3	1	3
	8	-	5	3	4	Ø	3	Ø	2	3	9	18	6	4	s	Ø	Ø	Ø
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	17	•	1	1	7	4	ø	1	1 -	-1	4	3	5	6	5	4	Ø	3
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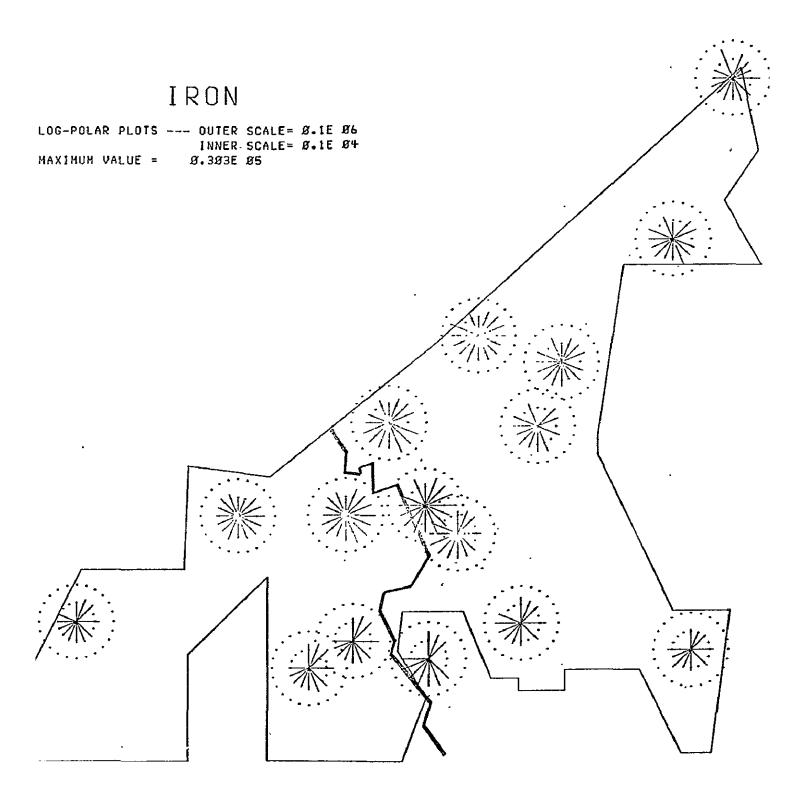
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### NUMBER OF READINGS .

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	3	-		3	3	4	Ø	3	Ø	2	3	9	11	6	5	4	Ø	Ø	ø
	4	-		Ø	Ø	2	1	Ø	2	B	1 .	1	s	5	4	6	s	Ø	3
	5	-		2	3	5	Ø	3	Ø	2	ø	6	8	4	4	5	1	ø	Ø
	6			1	Ø	5	3	Ø	5	1	1	1	1	5	4	5	1	Ø	3
	7	-		1	1	8	4	1	2	1	2	4	3	4	7	7	3	1	3
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	. 9			3	2	4	Ø	3	Ø	1	2	8	9	4	5	4	1	Ø	Ø
	18	-		1	1	8	3	1	S	1	1	3	1	6	8	8	4	Ø	4
	12	•		3	3	4	Ø	3	Ø	5	3	8	11	6	3	3	1	Ø	Ø
	-13	•	•	3	4	1	Ø	Ø	Ø	1	1	4	7	4	4	4	Ø	Ø	Ø
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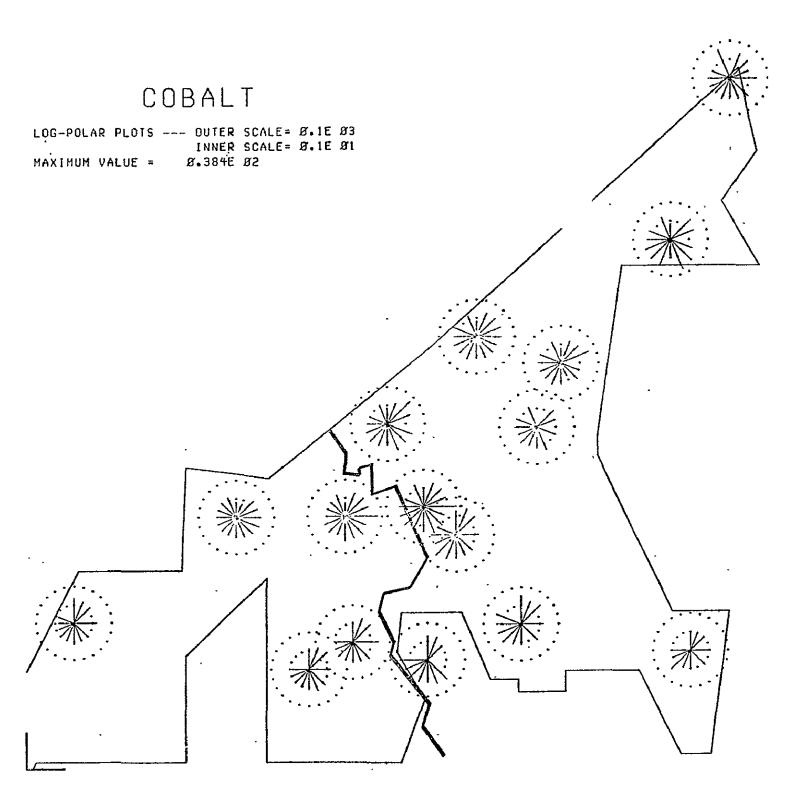


IRON

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	5	-	3	3	5	Ø	3	B	5	Ø	6	8.	4	4	2	1	Ø	Ø
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	17	•	1	1	7	4	Ø	1	1 -	- 1	4	3 .	5	6	5	4	Ø	3
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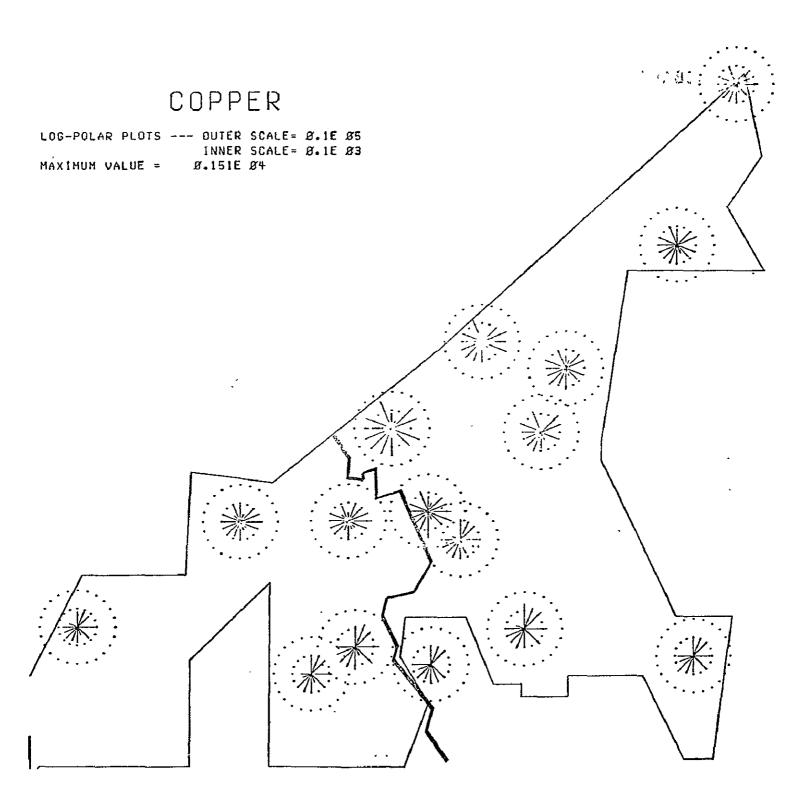


COBALT

# NUMBER OF READINGS

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	5			3	3	5	ø	3	-ø	s	ø	6	8	4	4	2	1	Ø	ß
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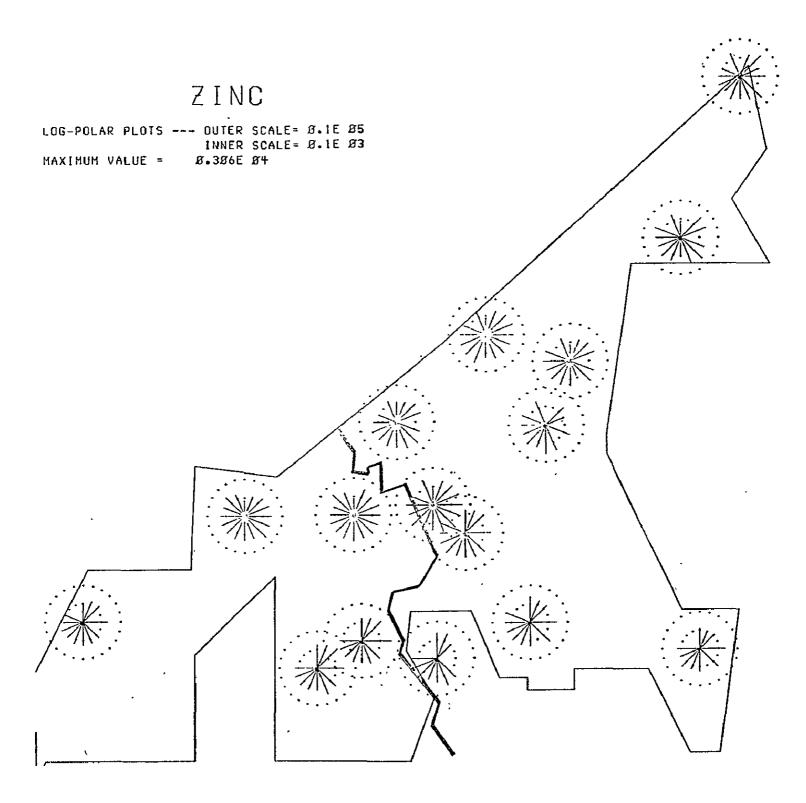


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# NUMBER OF READINGS

### . MIND ESOW

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	7	-	1	-1	6	4	1	2	-1	-1	4	2	4	5	3	1 -	- 1	3
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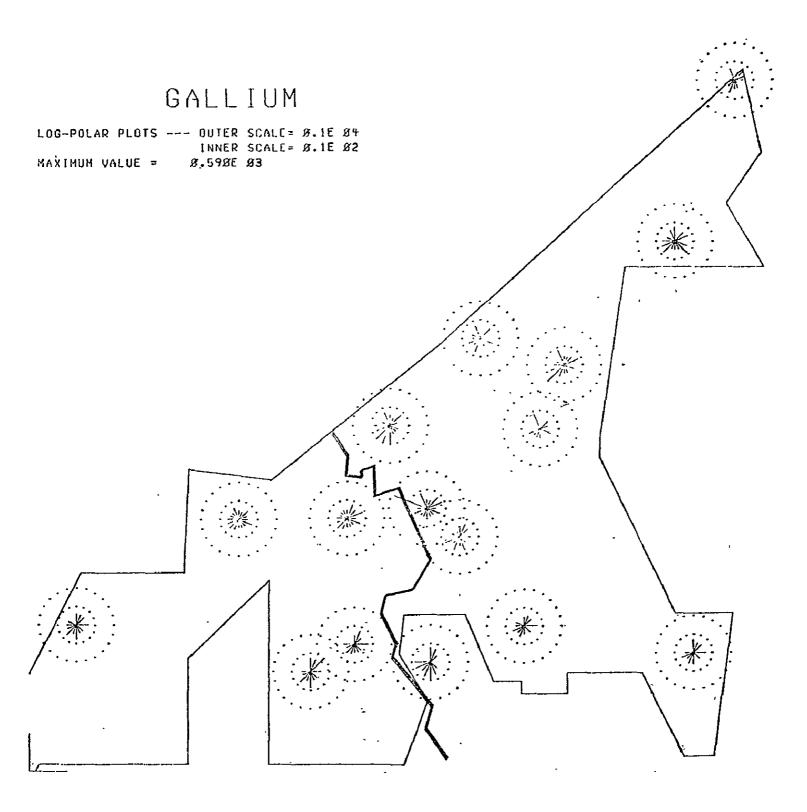


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	6	-	1	Ø	5	3	Ø	2	1	1	1	1	5	4	5	1	Ø	3
	7	••	1	1	8	4	1	2	1	2	4	3	4	7	7	3	1	3
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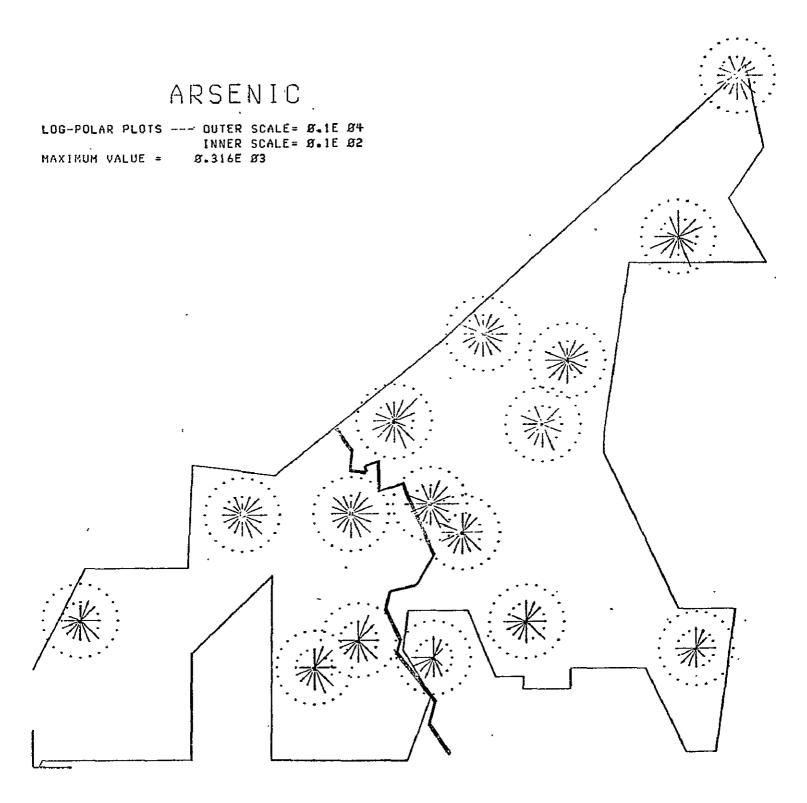


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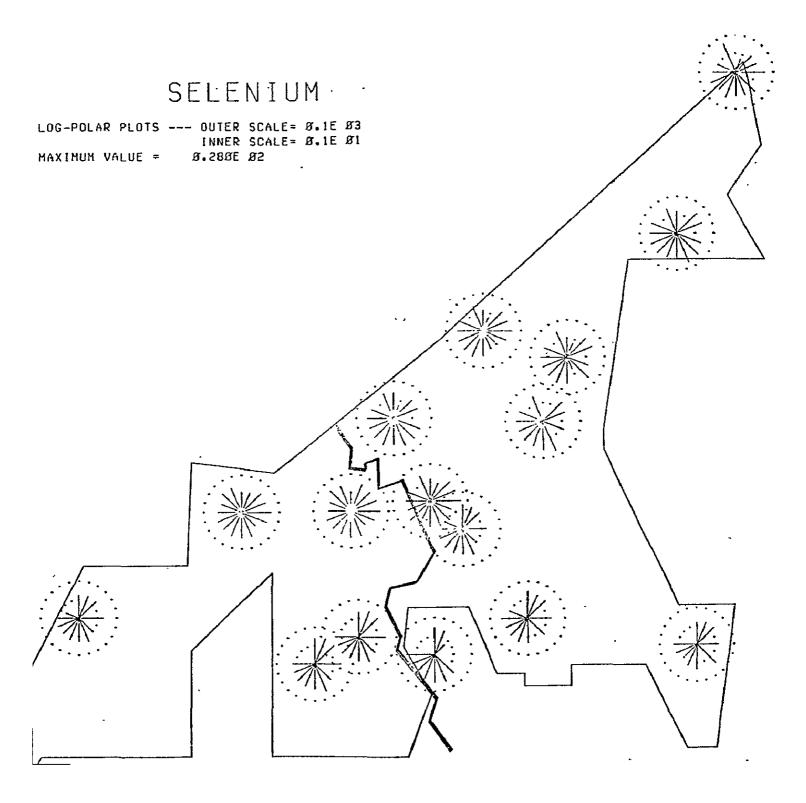


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		6	-	1		Ø	4	3	Ø	i	1	i -	- 1	1	4	4	5 -	- 1	Ø	3
		7	-	-1		1	7	3	1	1	1	5	2	3	3	6	7	s -	- 1	3
ш		8	-	3		3	3	Ø	3	Ø	1	3	6	7	5	3	2	Ø	Ø	Ø
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		13	-	3		4 -	-1	Ø	Ø	B .	-1	1	2	6	4	2	4	Ø	Ø	Ø
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		17		1		1	6	3	Ø	1	1 -	-1	1	3	4	6	5	3	Ø	3
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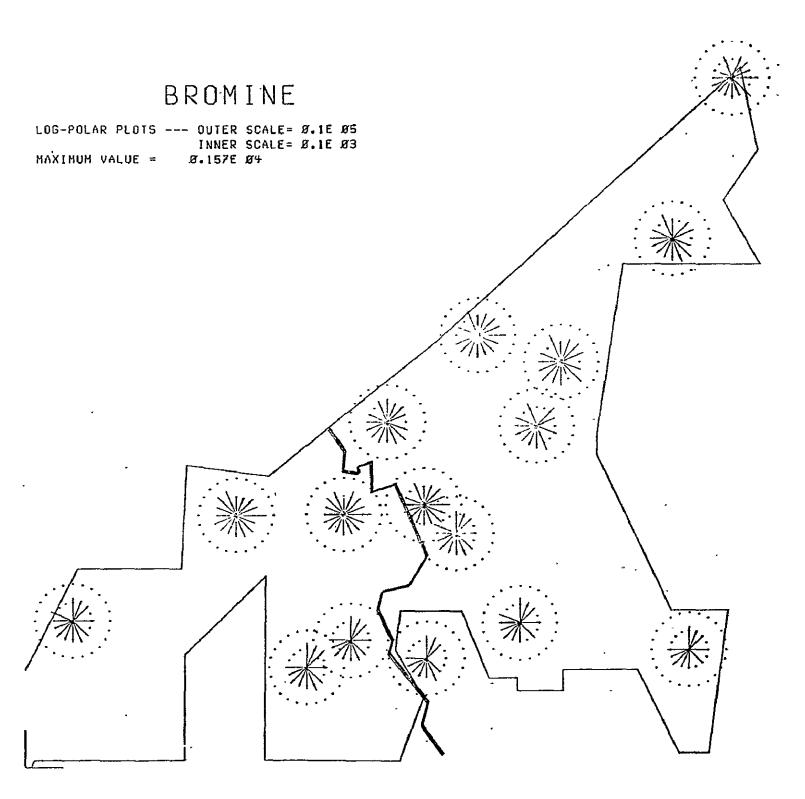
SELENIUM

\_\_ -I INDICATES ESTIMATED VALUE

### NUMBER OF READINGS

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	5	-		3	3	5	Ø	3	B	2	Ø	6	8	4	4	2	1	Ø	Ø
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	7	-		1	1	8	4	1	2	1	2	4	3	4	7	7	3	1	3
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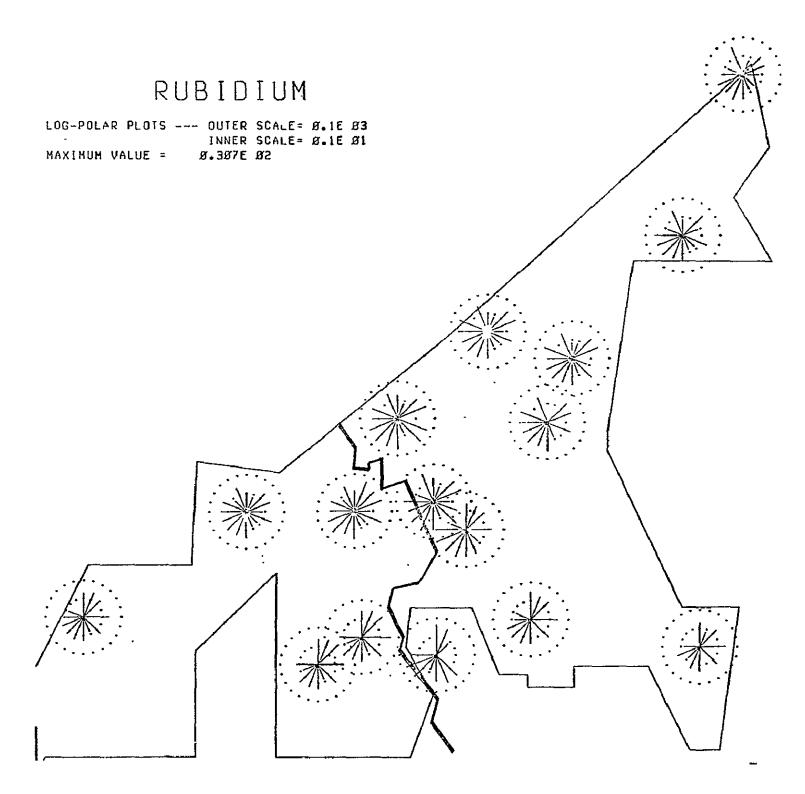


BROMINE

# NUMBER OF READINGS

MIND FLOW

		N	NNE	NE	ENE	٤	ESE	SE	SSE	S	SSW	SN	NSW	W	MNM	ИИ	NNW
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1	- '	1	1	6	4	1	1	5	2	5	2	6	4	7	3	ø	4
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5	-	3	3	5	Ø	3	Ø	2	B	6	8	q.	4	2	1	Ø	Ø
6	-	1	$\mathfrak{F}$	5	3	Ø	2	i	1	1	1	5	4	5	1	Ø	3
7	•	1	1	8	4	1	s	1	s	4	3	4	7	7	3	1	3
8	••	3	3	4	ø	3	Ø	2	3	9	18	6	4	2	Ø	Ø	Ø
9	-	3	2	4	Ø	3	Ø	1	s	8	9	4	5	4	1	Ø	Ø
12	•	1	1	8	3	1	2	1	1	3	i	6	8	8	4	B	4
12	•	3	3	4 .	Ø	3	Ø	5	3	8	11	6	3	3	1	Ø	ß
13	-	3	4	1	Ø	Ø	Ø	1	1	4	7	3	4	4	B	Ø	Ø
14	•	3	1	4	ß	3	Ø	ì	Ø	7	7	2	3	3	Ø	Ø	Ø
15	•	1	2	7	4	1	2	1	2	S	3	4	7	8	4	1	3
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21	-	1	1	7	1	Ø	t	2	2	3	2	3	6	6	4	Ø	3
	3 4 5 6 7 8 9 12 13 14 15 17 28	3 4 5 6 7 8 12 13 14 15 17 28	1 - 1 3 - 3 4 - 8 5 - 3 6 - 1 7 - 1 8 - 3 9 - 3 12 - 1 12 - 3 13 - 3 14 - 3 15 - 1 17 - 1 28 - 8	1 - 1 1 3 - 3 3 4 - 8 8 5 - 3 3 6 - 1 8 7 - 1 1 8 - 3 3 9 - 3 2 12 - 1 1 12 - 3 3 13 - 3 4 14 - 3 1 15 - 1 2 17 - 1 1 28 - 8 1	1 - 1 1 6 3 - 3 3 4 4 - 8 8 2 5 - 3 3 5 6 - 1 8 5 7 - 1 1 8 8 - 3 3 4 9 - 3 2 4 12 - 1 1 8 12 - 1 1 8 11 - 1 1 8 11 - 1 1 7 28 - 8 1 6	1 - 1 1 6 4 3 - 8 8 2 1 5 - 3 3 5 8 6 - 1 8 5 3 7 - 1 1 8 4 8 - 3 3 4 8 9 - 3 2 4 8 12 - 1 1 8 3 12 - 3 3 4 8 13 - 3 4 1 8 14 - 3 1 4 8 15 - 1 2 7 4 17 - 1 1 7 4 28 - 8 1 6 2	1 - 1 1 6 4 1 3 - 8 8 2 1 8 5 - 3 3 5 8 3 6 - 1 8 5 3 8 7 - 1 1 8 4 1 8 - 3 3 4 8 3 9 - 3 2 4 8 3 12 - 1 1 8 3 1 12 - 3 3 4 8 3 13 - 3 4 1 8 3 113 - 3 4 1 8 3 115 - 1 2 7 4 1 117 - 1 1 7 4 8 28 - 8 1 6 2 1	1       -       1       1       6       4       1       1         3       -       3       3       4       8       3       8         4       -       8       8       2       1       8       2         5       - 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RUBIDIUM

## NUMBER OF READINGS

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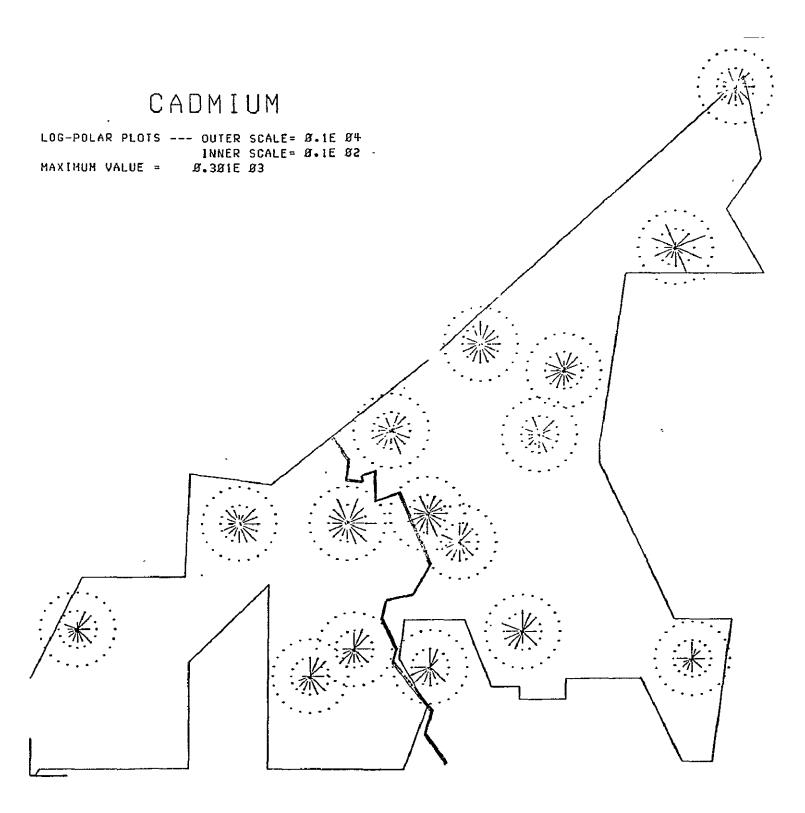
SILVER

## NUMBER OF READINGS

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	7	•	i	-1	3	3	- 1	s	-1	-1	3	1	3	5	3	-1	-1	3
L	8	-	1	-1	3	Ø	5	Ø	1	<b>- 1</b>	5	3	1	-1	-1	Ø	Ø	B
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	S&	•	Ø	-1	3	1	-1	Ø	1	-1	1	1	2	-1	2	-1	Ø	5
•	51		Ø	-1	5	2	Ø	1	1	-1	3	2	3	5	3	1	Ø	3

<sup>-1</sup> INDICATES ESTIMATED VALUE

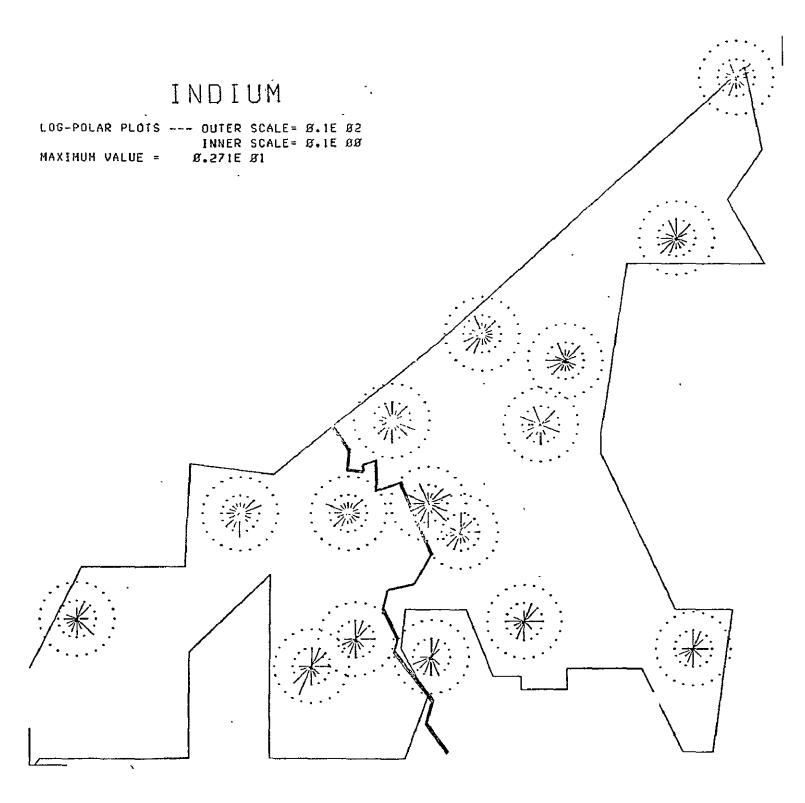


CADMIUM

# NUMBER OF READINGS

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	6	-		1	Ø	5	3	Ø	5	1	2	1		1	5	4	5	1	Ø	3
	7	4		1	i	8	4	1	2	1	3	4		3	4	7	7	3	1	3
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	12	-		4	3	4	B	3	Ø	2	3	9.	1	1	6	3	3	1	Ø	Ø
	13	•		3	4	1	Ø	Ø	Ø	1	1	4		7	4	4	4	Ø	Ø	Ø
	14	-		4	1	4	Ø	3	Ø	1	Ø	8		7	2	3	3	Ø	Ø	Ø
	15	-		1	s	7	4	1	2	1	3	2		3	4	7	8	4	1	4
	17	•		1	1	7	4	Ø	1	1	1	4		3	5	6	5	4	Ø	3
	S&			Ø	1	6	2	1	Ø	5	3	3		2	5	4	5	2	Ø	5
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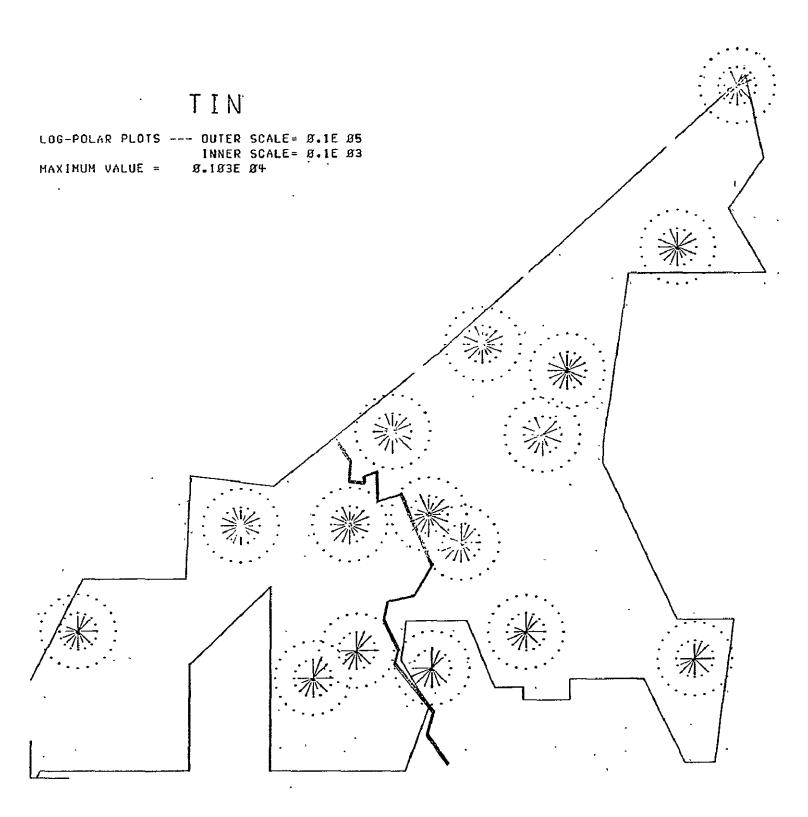


INDIUM

# NUMBER OF READINGS

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		N	I NN	IE NE	EN	E E	ES	E SE	<b>S</b> S S	E S	5 55	W Sh	H HS	SH H	l WK	IN NH	NNN
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5	-	-1	1	1	ø	1	Ø	-1	ø	ī	1	-1.	-1	1	1	Ø	Ø
ь		1	Ø	1	-1	Ø	-1	-1	<b>-1</b>	-1	1	1	. 1	1	-1	æ.	1
7		- <b>i</b>	-1	4	1	<b>- 1</b>	- 1	-1	-1	1	1	1	<b>-1</b>	1	- 1	-1	-1
. 8	-	1	1	2	Ø	2	Ø	-1	-1	i	2	2	-1	1	Ø	Ø	Ø
9	-	1	-1	1	Ø	s	B	-1	-1	-1	5	1	-1	-1	-1	Ø	Ø
18	-	- 1	-1	4	-1	-1	-1	-1	- i	- i	1	3	3	i	-1	Ø	i
12	•	-1	i	s	Ø	-1	Ø	1	-1	· 2	1	-1	-1	.1	-1	Ø	Ø
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·17	-	-1	-1	4	-1	Ø	-1	-1	-1	<b>-1</b>	-1	1	2	3	-1	Ø	1
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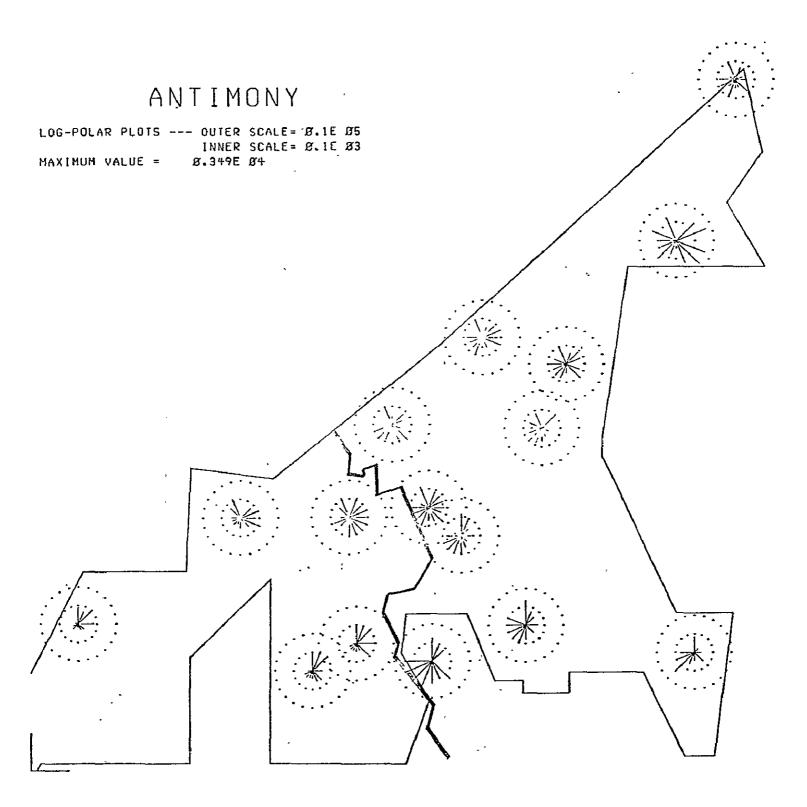


TIN

## NUMBER OF READINGS

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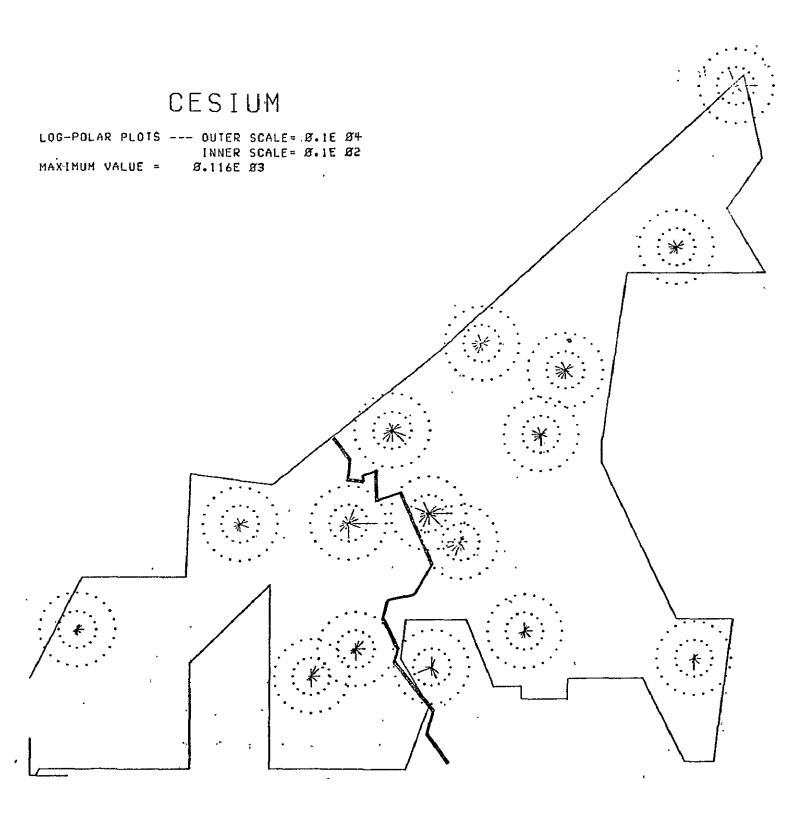


ANTIMONY -

## NUMBER OF READINGS

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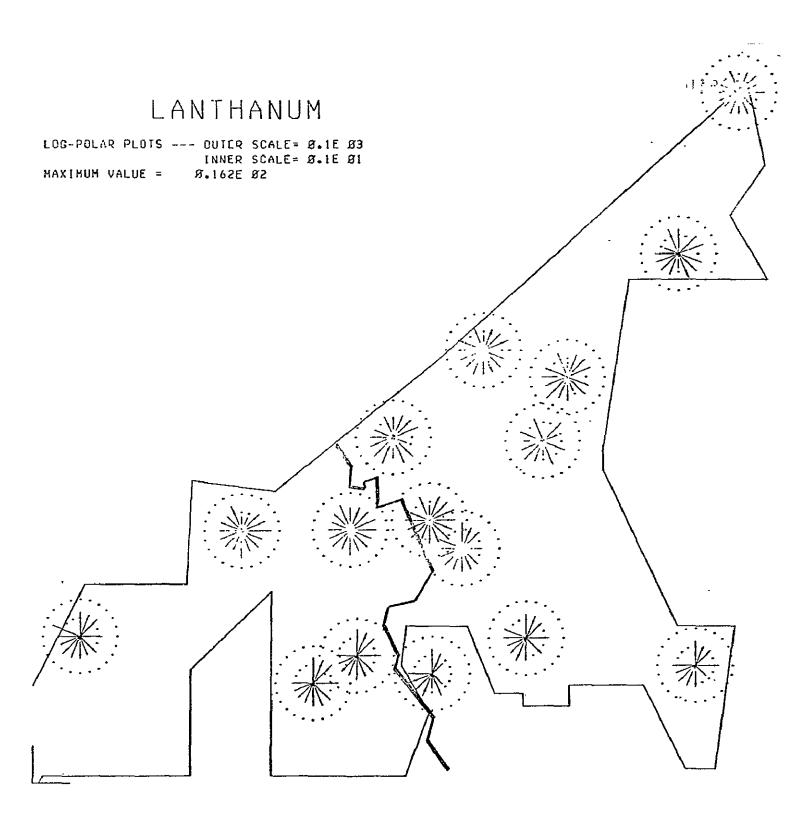


CESIUM

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19	5	-	-	-1	1	5	4	1	2	-1	-1	2	1	4	4	4	1 -	-1	3
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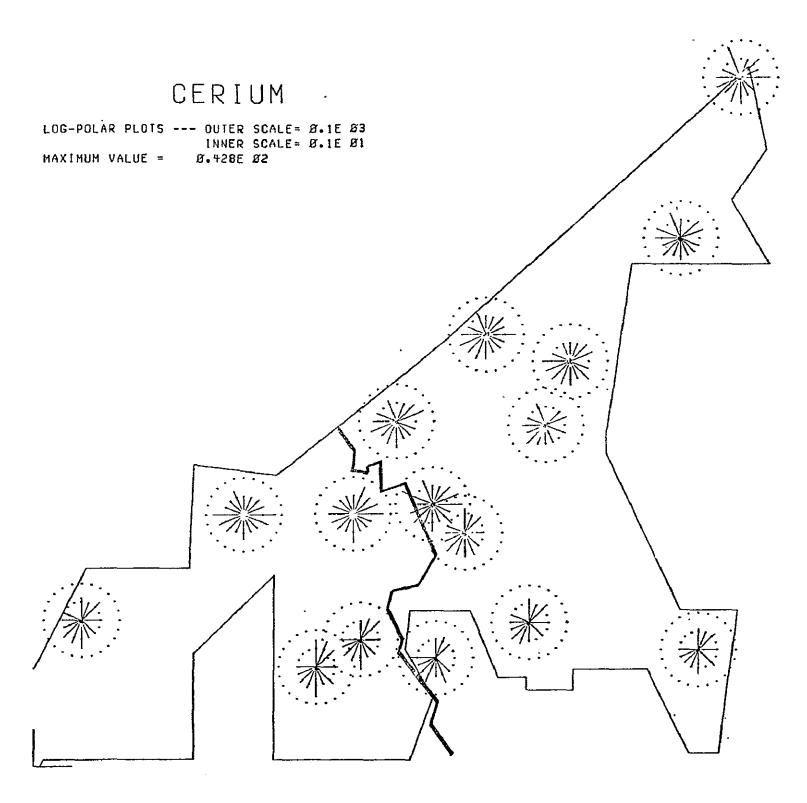


LANIHANUM

# NUMBER OF READINGS

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	7	-	-1	1	6	1	1	1	1	2	1	3	s	7	6	2	ì	2
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	12	-	5	3	3	Ø	2	Ø	1	3	3	8	6	3	2	1	Ø	Ø
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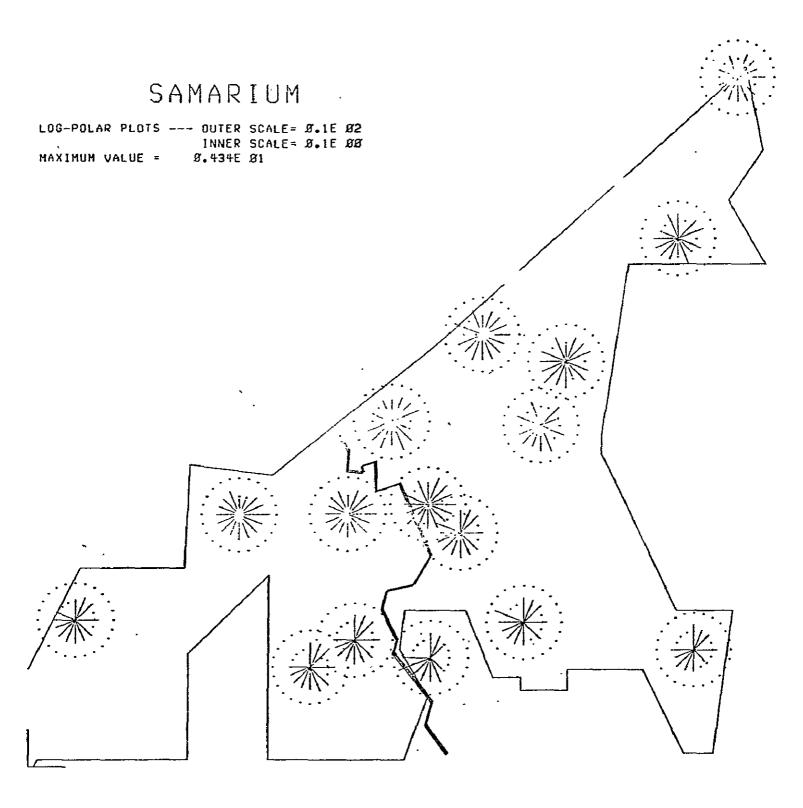


CERIUM

# NUMBER OF READINGS

### WIND FROM

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	8	-	1	2	5	Ø	1	Ø	1	-1	. 1	3	2	-1	-1	Ø	Ø	Ø
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	14	-	5	-1	2	Ø	-1	Ø	1	Ø	2	-1	-1	-1	-1	Ø	Ø	Ø
	15	-	-1	1	4	2	1	-1	`-1	-1	1	i	1	1	2	1	<b>- i</b>	-1
	17		-1	-1	5	1	Ø	<b>-1</b>	1	-1	2	2	1	2	I	-1	Ø	-1
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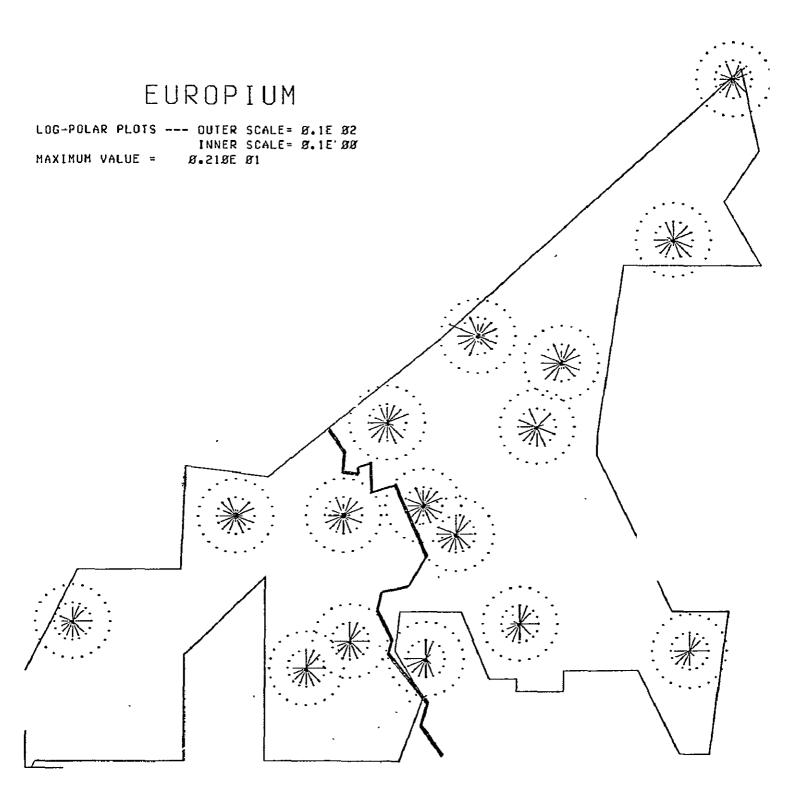


### SAMARIUM

## NUMBER OF READINGS

#### MIND FROM

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	5	-	3	3	4	Ø	3	ø	1	Ø	3	4	4	4	2	1	Ø	Ø
	6	-	1	Ø	3	3 '	3	1	- 1	1	-1	I	3	4	4 -	- 1	<b>ø</b> .	3
	7	-	-1	1	7	3	1	1	1	2	1	3	3	7	6	2	1	3
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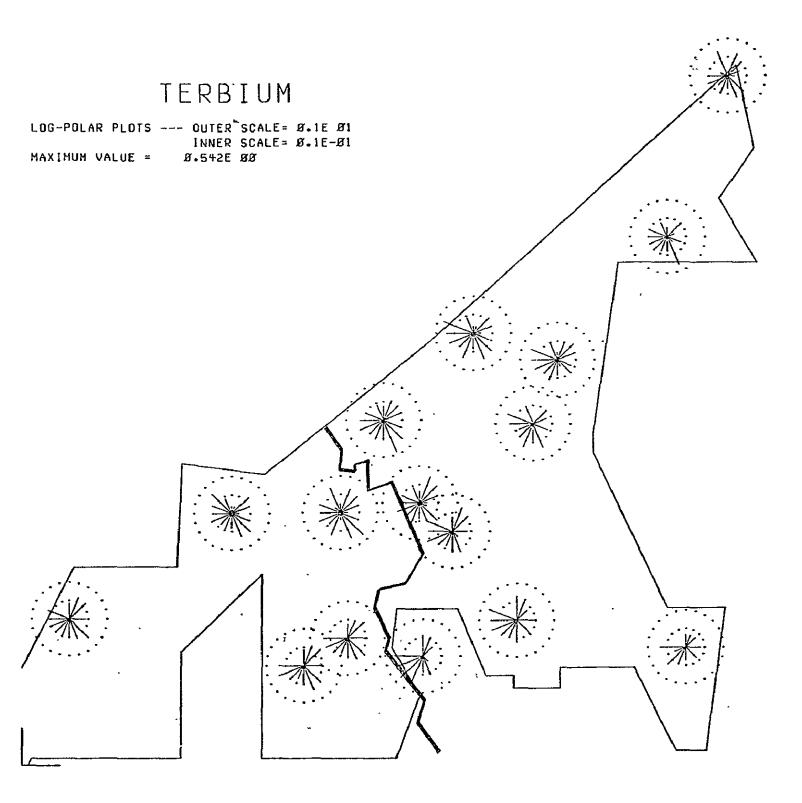


**EUROPIUN** 

## NUMBER OF READINGS

#### WIND FROM

ENE E ESE SE SSE S SSW SW WSM W WWW NW 3 -1 1 2 1 -1 2 Ø Ø 2 Ø 3 Ø -1 -- 1 **– i** -1 3 3 3 2 3 3 , 3 8 3 Ø 5 7 Ø Ø Ø 3 Ø 1 2 2 5 5 1 18 7 3 12 3 Ø 13 -1 Ø Ø Ø 2 5 1 S Ø Ø Ø 3 Ø 5 3 3 Ø 3 Ø Ø ž 3 3 Ø Ø 2 Ø Ø -1 2 2 5 2

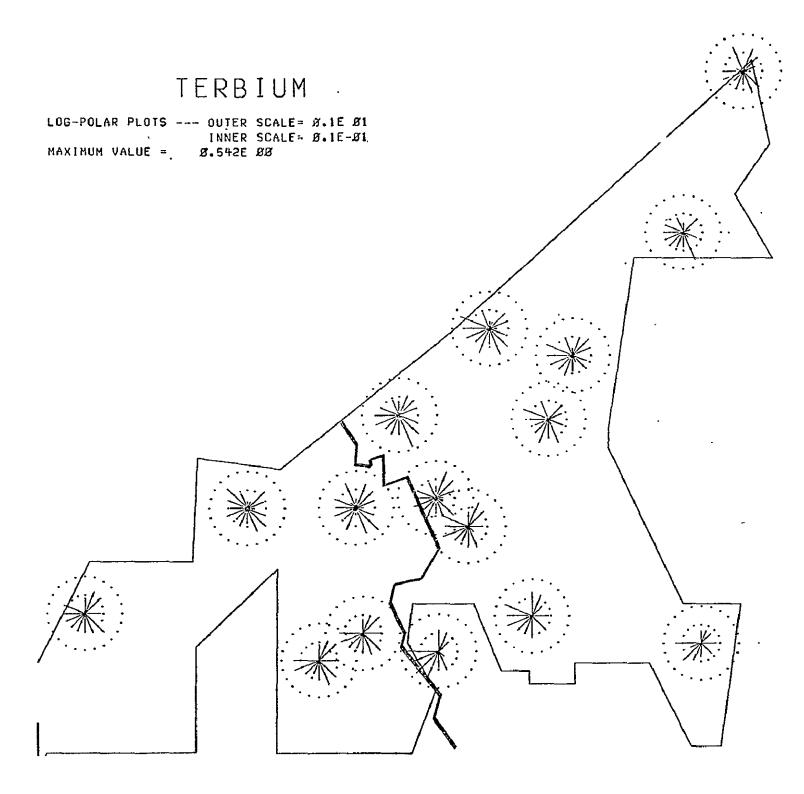


TERBIUM

# NUMBER OF READINGS

#### WIND FROM

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	13	•	2	4	1	Ø	Ø	; <b>8</b>	-1	1	3	5	1	5	3	Ø	Ø	B
	14	-	3	1	4	Ø	s	Ø	i	Ø	5	4	1	1	2	Ø	Ø	Ø
	15	•	1	1	7	4	-1	5	1	s -	-1	1	3	5	8	2 -	·ŧ	2
	17	••	-1	1	7	4	Ø	i	1	-1	3	3	5	6	5	4	Ø	3
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	21		ı	1	6	2	Ø	1	2	5	3	2	3	6 .	5	4	Ø	3

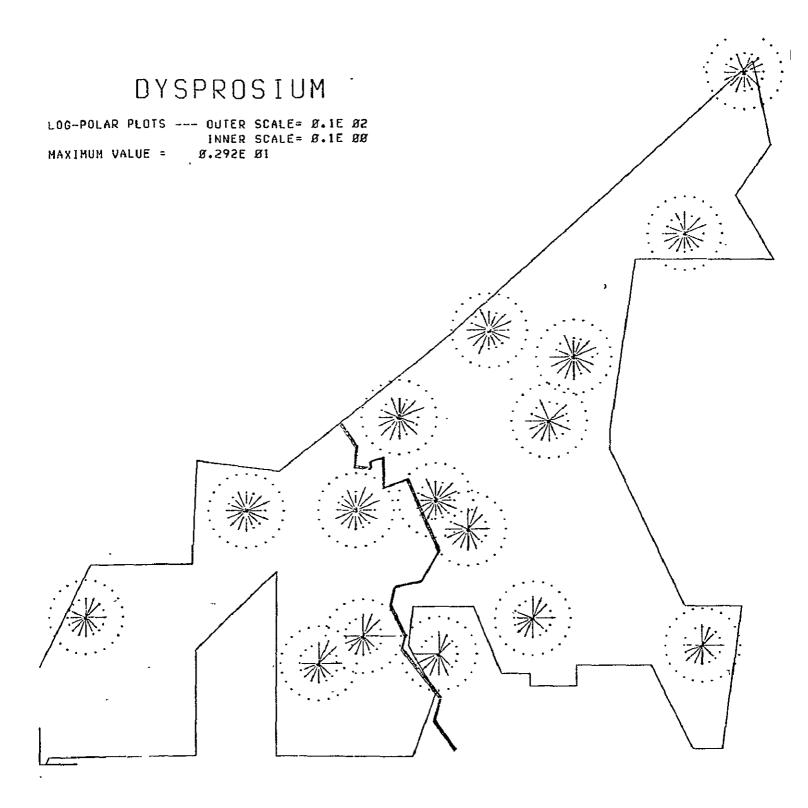


TERBIUM

## NUMBER OF READINGS

#### WIND FROM

ENE E ESE SE SSE S SSW SW WSW NNW 1 1 5 2 i Ø 2. 5 Ø 2 Ø 2 2 8 4 3 8 Ø Ø Ø Ø 2 3 - Ø 2 Ø 5 3 2 Ø б 1 2 Ø 3 Ø Ø -1 2 2 3 2 3 8 Ø Ø S 2 Ø 3 2 7 8 Ø Ø 1Ø **– 1** -1 3 -1 2 i 2 12 2 3 3 Ø 3 Ø 5 3 7 18 5 2 Ø Ø 2 Ø Ø 13 Ø Ø Ø 3 5 Ø 14 • 4 Ø 2 Ø Ø 5 1 1 2 Ø Ø Ø 15 7 4 -1 S 5 5 8 2 -1 2 -1 3 17 -1 ø. Ø 3 2 **2**8 -: Ø 2 2 -1 Ø 21 2 2 5 2 3 5 Ø 3 Ø

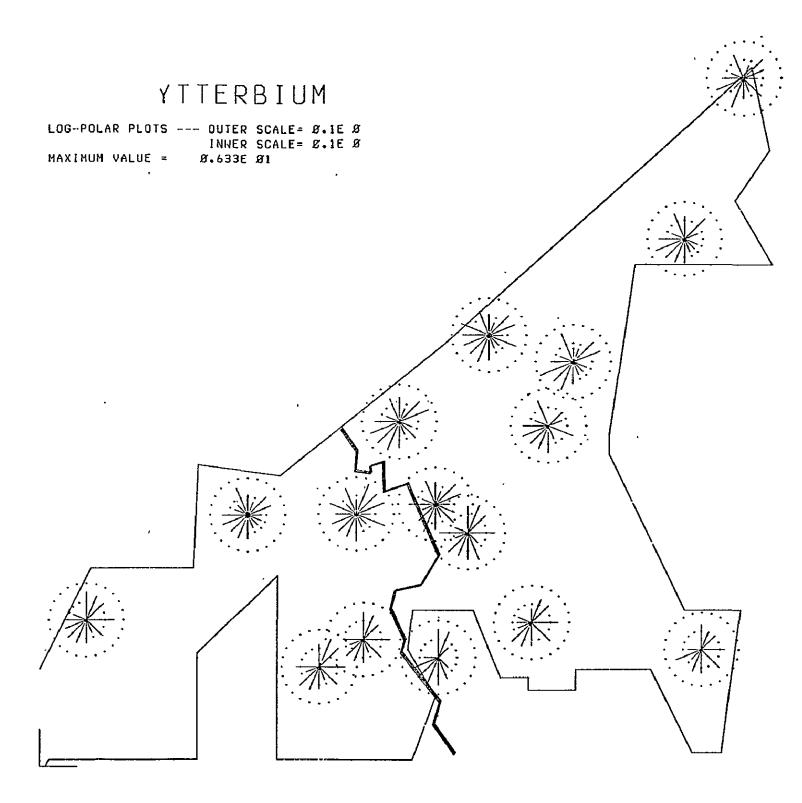


#### DYSPROSIUM

# NUMBER OF READINGS

#### WIND FROM

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	3	-	3	3	5	2	Ø	3	B	-1	-1	3	6	4	1	2	Ø	Ø	Ø
	4	•	1	ř	Ø	2	-1	Ø	1	Ø	-1	1	1	4	3	3	-1	Ø	3
	5		:	l	5	3	Ø	3	Ø	-1	ø	2	5	2	-1	- 1	-1	Ø	Ø
	6	-		l	Ø	4	3	Ø	ì	1	-1	-1	1	4	2	3	-1	ø.	3
	7		•	l	<b>-1</b>	5	3	-1	1	-1	-1	1	2	3	5	3	-1 -	-1	3
ш	8	<b></b>	:	3	5	5	Ø	3	ß	-1	-1	3	5	4	-1	ı	Ø	a	Ø
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ဟ	1.8	-		l	<b>-1</b>	5	3	-1	i	-1	-1	-1	1	5	5	4	-1	Ø	4
	12		:	3	2	s	Ø	3	Ø	-1	-1	3	6	4	-1	2	<b>-1</b>	Ø	Ø
	13	-	;	3	3	-1	Ø	Ø	8	<b>- 1</b>	1	5	5	4	i	5	Ø	8	Ø
	14	-	;	2	1	3	Ø	3	Ø	-1	Ø	3	4	i	3	1	Ø	Ø	Ø
	15	•		i	1	5	3	-1	1	<b>-1</b>	- 1	1	1	4	3	4	-i -	- 1	3
	17	-		i	-1	4	3	ø	1	1	-1	1	2	4	4	3	-1	Ø	3
	2Ø	-	ļ	3	-1	4	2	-1	Ø	1	-1	-1	2	1	S	3	-1	Ø	4
	21	**		ı	-1	4	1	Ø	-1	1	-1	1	S	2	2	3	-1	B	3

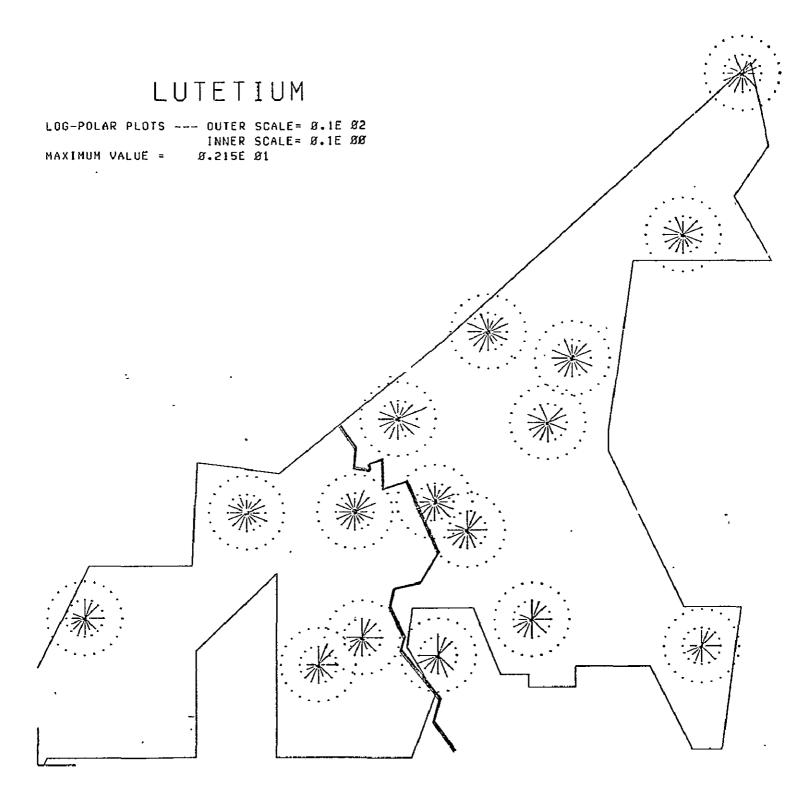


YTTERBIUM

## NUMBER OF READINGS

#### WIND FROM

NNE NE ENE E ESE SE SSE S SSW SW WAN MUMMM MAN 1 1 2 1 - 1 Ø 3 Ø Ø 2 5 -1 Ø 2 2 Ø 5 Ø Ø 2 -1 Ø 1 Ø 2 -1 Ø Ø 3 2 3 3 -1 3 Ø 3 5 -1 18 -1 -1 5 5 8 3 -1 -1 12 2 2 3 Ø 13 3 2 - i Ø 8 3 Ø -1 1 3 S Ø Ø 14 Ø 3 i Ø Ø 15 # 5 3 -1, 2 -1 -1 1 17 -1 3 3 Ø - 1 -1 -1 2 5 5 3 2 Ø 3 -1 3 2 - i -1 5 2 21 2 -1 2

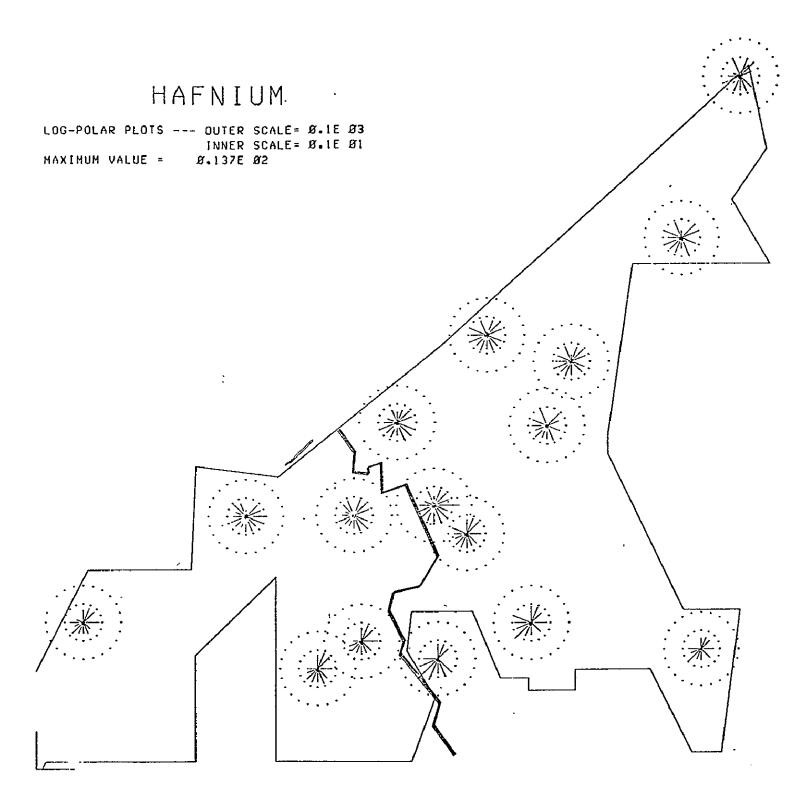


LUTETIUM

## NUMBER OF READINGS

#### WIND FROM

NNE NE ENE E ESE SE SSE S SSW SW 1 3 2 2 3 3 3 Ø Ø Ø Ø Ø 2 1 Ø 2 1 1 5 3 3 Ø 3 Ø -1 5 Ø 2  $\mathfrak S$ Ø Ø **– 1** 2 Ø Ø 3 -1 1 -1 3 -1 3 2 3 - 1 6 2 3 3 -1 6 7 Ø Ø 3 3 1 3 Ø 18 -1 Ø 12 2 2 -1 6 2 13 5 3 Ø Ø 1 3 1 İ 1 Ø Ø Ø 14 2 3 Ø Ø Ø 2 Ø Ø 15 1 5 -1 S -1 -1 1 2 3 -1 3 2 5 17 5 Ø 1 -1 3 3 Ø 3 S 5 2 28 5 21 -1 5 2 Ø -1 3 5 5

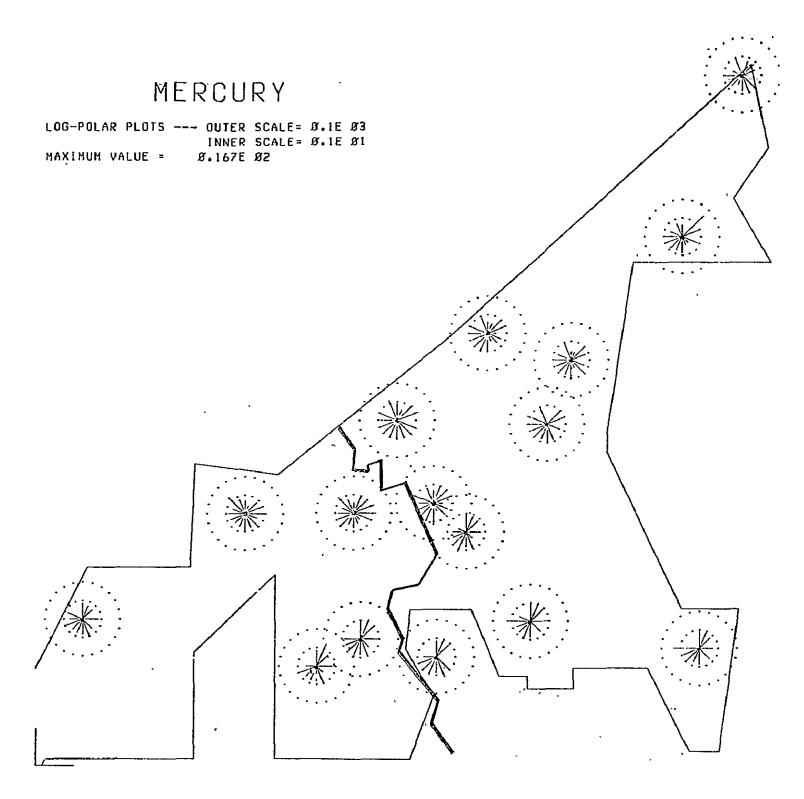


HAFNIUM

## NUMBER OF READINGS

WIND FROM

NNE NE ENE E ESE SE SSE S SSW SW WSW ı 2 . Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø 4 . 2 Ø ß Ø Ø -1Ø Ø Ø Ø Ø Ø Ø Ø ı - 1 3, Ø Ø Ø Ø Ø Ø Ø Ø Ø I Ø Ø Ø Ø Ø -1 Ø И -1 -1 S Ø . 4 Ø Ø ì . 3 Ø 

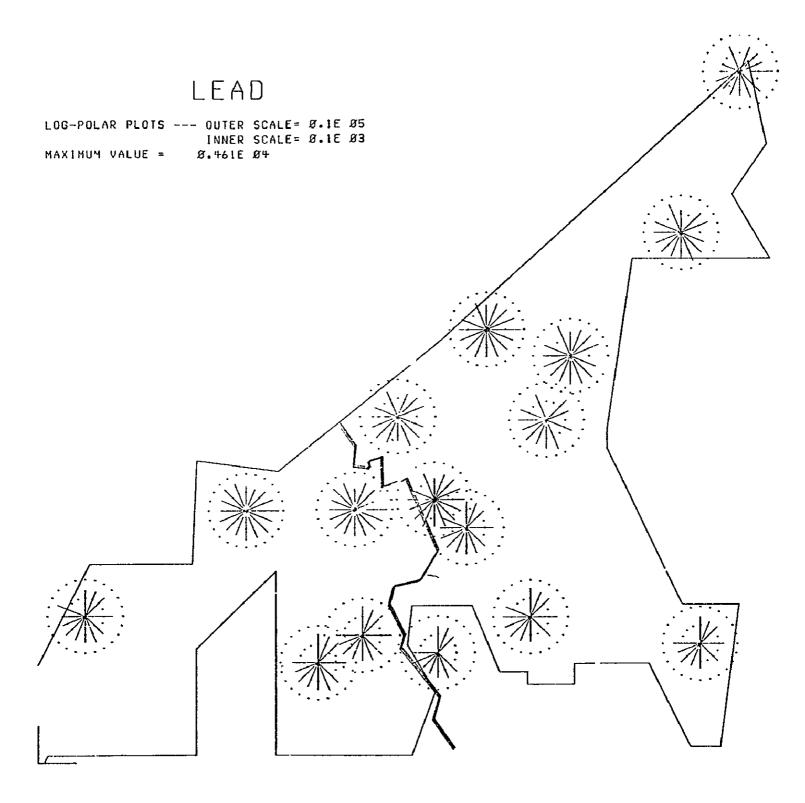


#### MERCURY

## NUMBER OF READINGS

#### WIND FROM

NNE NE ENE E ESE SE SSE S SSN SN WEN H ни нин 4 -1 -1 Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø - i -1 Ø -1 Ø Ø -1 -1 Ø Ø -1Ø Ø Ø Ø Ø Ø Ø Ø Ø -1 Ø Ø SØ -1 Ø Ø Ø Ø 

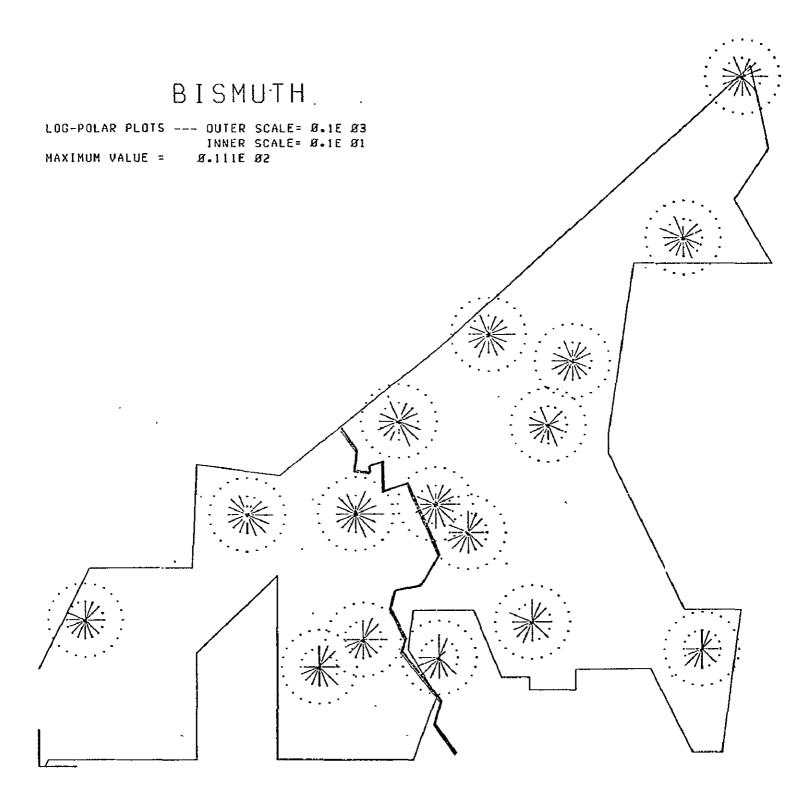


LEAD

## NUMBER OF READINGS

#### WIND FROM

NNE NE ENE E ESE SE SSE S SSW SW WSW WW WW NNM Ø Ø Ø i 1 Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø 1 . B Ø г Ø Ø Ø Ø Ø Ø Ø I Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø ,1 Ø ı ı Ø Ø Ø Ø 21- -Ø Ø 

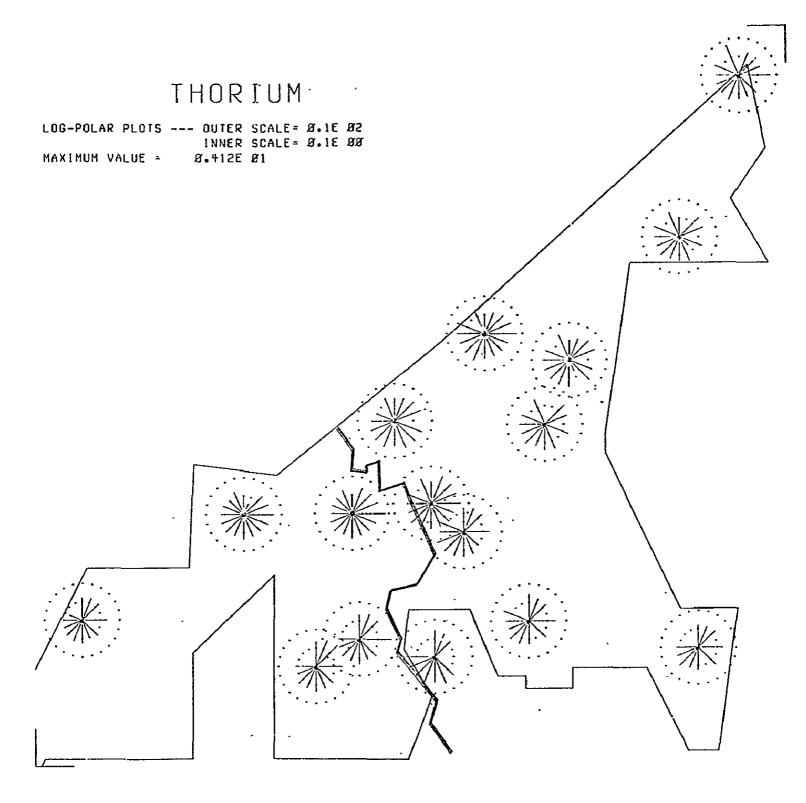


BISMUTH

## NUMBER OF READINGS -

#### WIND FROM

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THORIUM

# NUMBER OF READINGS

#### WIND FROM

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3	•	3	3	4	Ø	3	Ø	2	3	9	ıì	6	5	4	Ø	Ø	Ø
4	-	Ø	Ø	2	1	Ø	2	Ø	1	1	2	5	4	6	٤.	Ø	3
5		3	3	5	Ø	3	Ø	2	Ø	6	8	4	3	2	1	Ø	Ø
6	·	1	ø .	5	2	Ø	1 -	- 1	1	1	1	4	4	5	1 .	Ø	3
7	-	1	1	8	4	1	5	1	s	4.	3	4	7	7	5	1	3
8	-	3	3	4	Ø	3	Ø	2	3	9	18	6	4	2.	Ø	Ø	Ø
9		3	5	4	Ø	3	ø.	1	2	8	9	4	4	4	1	Ø	Ø
18	-	1	1	8	3	1	2	1	1	3	1	6	8	8	4	Ø	4
15	-	3	3	4	Ø	3	Ø	1	3	8	18	6	3	3	1	Ø	ġ
13	-	3	4	1	Ø	ø	Ø	1	1	3	6	2	3	4	Ø	Ø	Ø
I "F	-	3	1	4	Ø	3	Ø	1	Ø	6	7	5	3	3	Ø	Ø	Ø
15	-	1	s	7	4	1 ·	2	I	5	\$	3	4	7	7	4	1	3
17	-	1	1	6.	4	Ø	1	1 -	-1	4	3	5	6	5	4	Ø	3
2 <b>&amp;</b>	-	Ø	1	6	s	i	Ø	2	2	3	5	S	4	5	s	ø	4
21	-	1	i	7	s	Ø	1	2	2	3	2	3	6	6	4	Ø	3

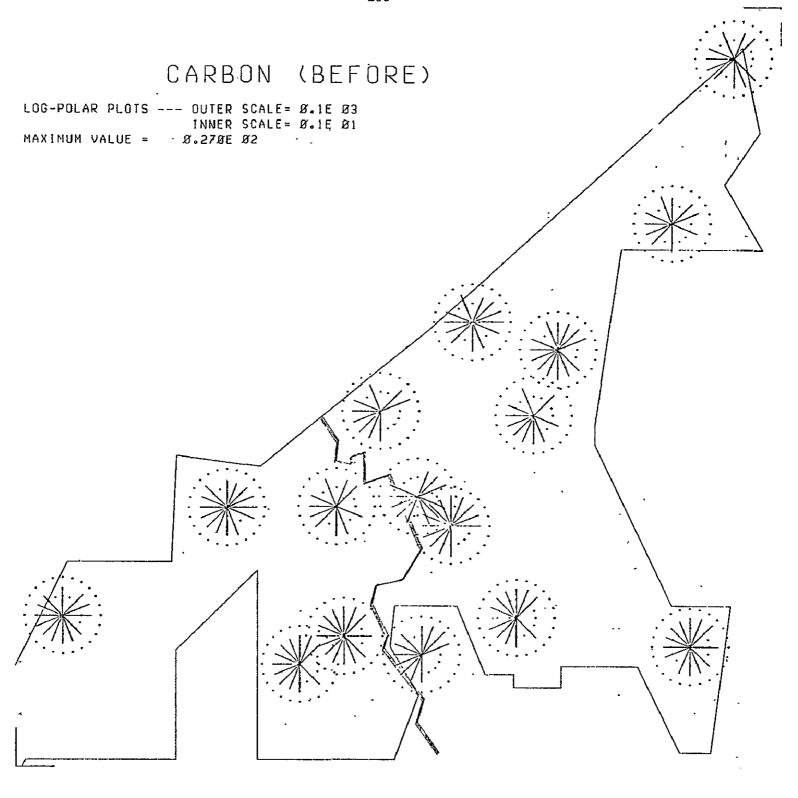
#### CARBON (BEFORE)

# NUMBER OF READINGS

#### WIND FROM

			N	NNE	NE	ENE	E	ESE	SE	SSE	5	SSW	SW	พรพ	M	MHW	NW	NNM,
	• • • • •	· · · ·						<b></b>										<b>"</b>
	1	-	Ø	1	2	3	Ø	1	1	1	Ø	1	4	3	4	1	Ø.	Ø
	3		<b>4</b>	2	2	ø	1	Ø	i	1	5.	6.	1	4	3	4	5	1
	. 4	÷	Ø	Ø	1	Ø	Ø	1	ß	1	1 .	2	5	2	4	2	Ø	3
	5	.••	1	1	3	Ø	Ø	Ø	1	Ø.	3	6	i	5	3	2	2	1.
	6	-	1	Ø	3	3	3	5	Ø	Ø	1	Я	3 .	3	.2	1	B	2 .
	7	₩	1	1	7	3	1	2	Ø	1	4	3	4	4	5	2	1	Ø
ئيا	8	<b>H</b>	4	1	1	ø.	Ø	Ø	1	Ø	5	6	3	,3 ·	3	3	5	1
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	21	-	ø	Ø	3	1.	Ø	ø.	Ø .	Ø	3	2	1	3	4	2	Ø	2.

<sup>-1</sup> INDICATES ESTIMATED VALUE

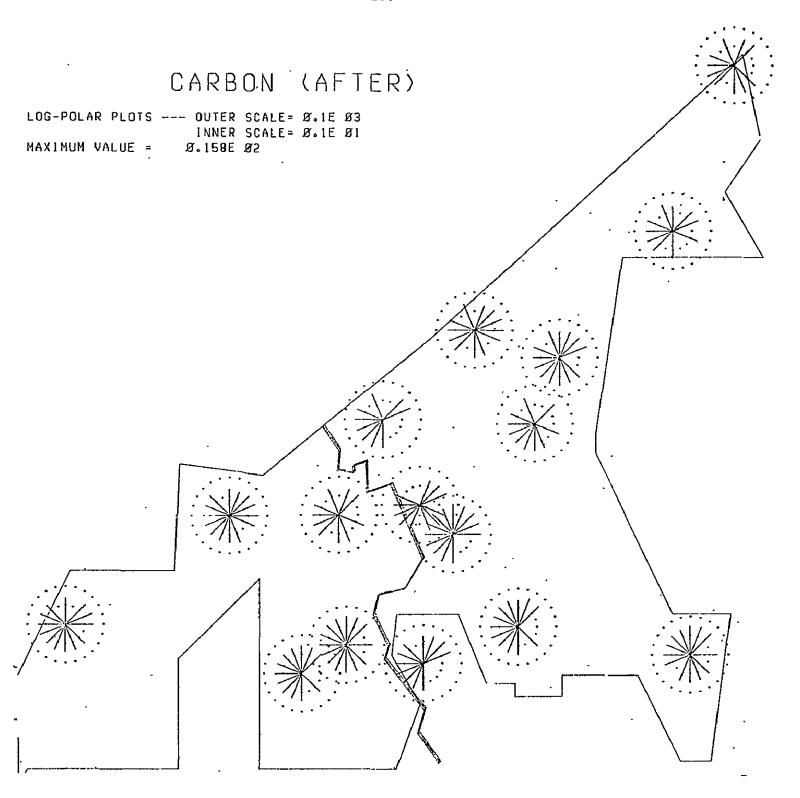


CARBON (AFTER)

# NUMBER OF READINGS

#### WIND FROM

ESE SE ENE SSE Ø .5 Ø Ø 3 . Ø Ø Ø Ø Ø • 1 Ø Ø Ø Øʻ Ø Ø  $\mathbf{z}$ Ø Ø Ø Ø Ø Ø Ø Ą 1 -٠Ø Ø Ø Ø Ø Ø Ø Ø Ø 8. S .2 Ø Ø Ø Ø Ø Ø Ø 4 . 1.7 i Ø Ø ĺ IJ Ø . B Ø i Ø Ø Ø Ø

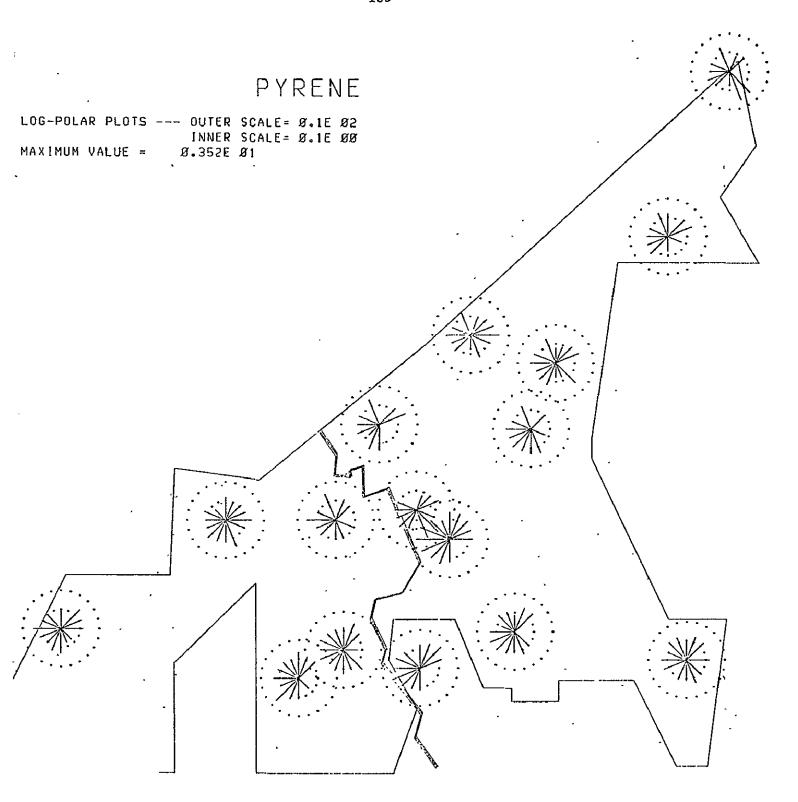


PYRENE

# NUMBER OF READINGS

#### HIND FROM

			N	NNE	NE	ENE	E	ESE	SE	SSE	\$	SSW.	SW	WSW	И	MNM	ИМ	NNW
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	,3		4	1	2	Ø	1	Ø	1	1 .	4	5	1	3	3	4	<b>4</b>	1
SITE	4	<b>~</b>	3	Ø	1	2	Ø	1	ø	1	1	1	5	2.	5	2	Ø	3
	5	-	1	1	3	Ø	Ø	Ø	1	1	3	6	1	2	3	2 .	2	1
	6	4	1	Ø	3	3	ø -	- 1	Ø	Ø	1	Ø	3	3	1.	1	Ø	2.
	7		1	1	7	3	I	2	Ø	1	3	3	3	4	5 .	1 -	-1	Ø.
	8	<b></b>	3	.1	1	Ø	ß	Ø ·	- 1	2	4	6 .	5	3	3	3	5	1
	9	**	2 .	1	3 .	1	1	B	Ø	Ø	3	6	1 .	4.	3	1	5	2
	13	<b>H</b>	Ø	1	2	2	1	. 5	ø,	2 .	- 1	Ø	4	6	4	3	Ø	2
	15		3	Ø	3	1	4	<b>3</b> -	- 1	1	4	2	1	3	2	1	3	3
	13		3	1	1	1	Ø	Ø	Ø	Ø	1	2	1	4	2.	3	1 .	Ø
	14	н	2	1	1	Ø	1	Ø	i	1	1	2	Ø	3	2	1	3	2
	15	-	Ø	1	2	Ø	8	5	Ø	1	1	Ø	2	4	2	3	Ø	2
	17		1	1	5	3	Ø	Ø	1	1 .	-1	3	2	3	2 .	3	Ø	\$
	58	<b>w</b>	Ø	1	3	Ø .	3	ß	1	1 .	- 1	Ø	5	2	3	1	Ø	2
	21,	<b></b>	Ø	Ø	I	1	Ø	Ø	Ø	Ø	2	2 -	1	3	3	2	Ø	1

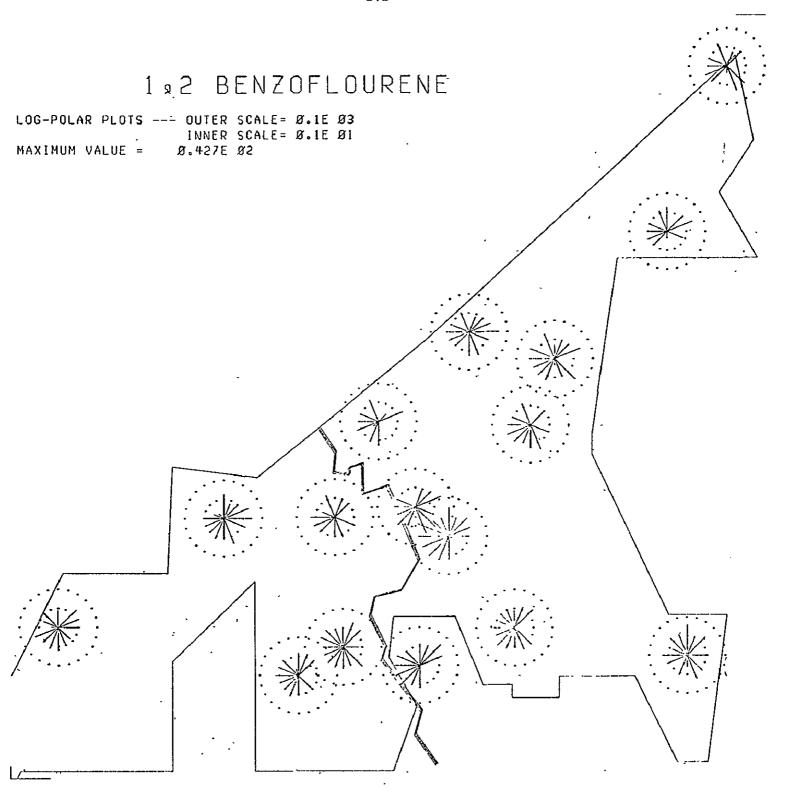


## 1,2 BENZOFLOURENE

# NUMBER OF READINGS

#### WIND FROM

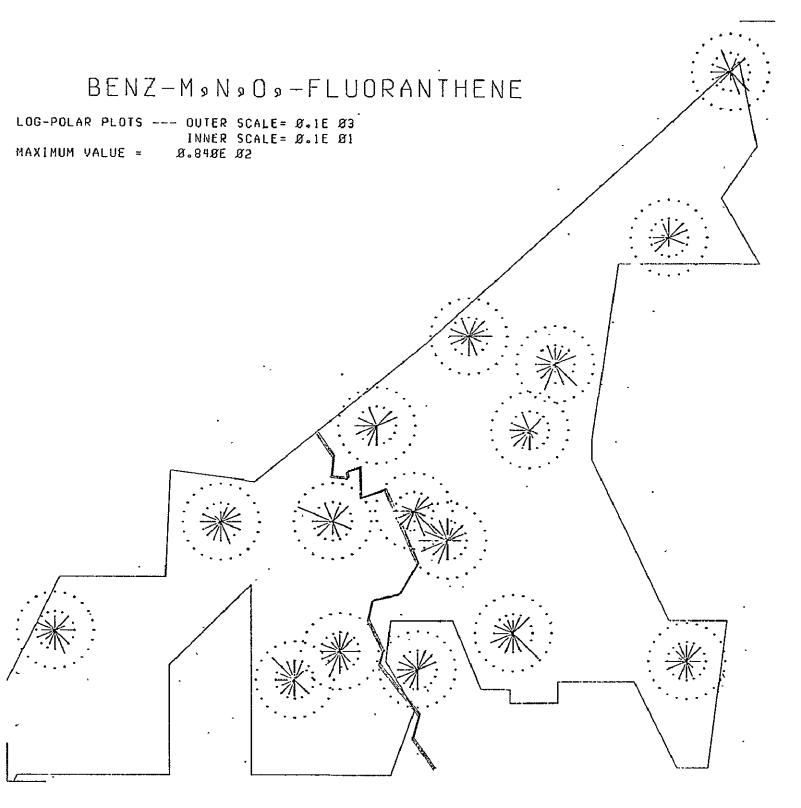
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4	<b>-</b>	Ø	Ø	1	Ø	Ø	1	Ø	1	1	2	5 <i>·</i>	2	8	2	Ø	3
5		1	1	3	Ø	Ø	Ø	1	i	3	5	i	.2	2	5	5	1
6	-	1	Ø	2	3	Ø	1	Ø	·ø ·	- 1	Ø	3	3.	1	1	Ø	2
7	~	1	1	7	3	i .	2	Ø	1	4	2	3	r)	4	S -	- 1	Ø
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9		2	1	3	1	1	Ø	Ø	ø	3	7	1 -	4	3	1	2 .	2
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12	-	3	Ø	3	1	1	Ø	i	1	4	3	1	3 -	- 1	5	3	ø
13	••	<u>.</u> 4	1	1	1	Ø	Ø	Ø	Ø	1	3	1	4	2	3	1	Ø
1 4.		2	1	1	ø,	1	Ø	1	1	1	2	<b>Q</b>	3	1	1	3	ž
15	м.	Ø	1	3	g	Ø	2	Ø	1.	1	Ø	2	4	2	2	Ø	ż ·
17	-	1	ı	4	3	Ø	Ø	ŀ	1 -	- 1	3	3	5 .	3	4	Ø	2
5,8	**	Ø	1	3	ø.	Ø	Ø	i	1	- 1	ø.	S	2	3,	1	Ø	2
21		Ø	ø·	2	1 /	Ø	Ø	ø.	Ø	3	2	1 .	3	4	2	Ø	s



# BENZ-M.N.O.-FLUORANTHENE NUMBER OF READINGS

#### WIND FROM

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	. 1			Ø	1	2	з.	ø	1	1	1	Ø	1	4	3	4	5	Ø	ø.
	3	<b>.</b>		4	1	2	Ø	1	Ø	1	1	4	6	1	4	3	4	4	1
	٠4			Ø	Ø	1	Ø	ø	1	Ø	- i	1	2	5	2	5	2	Ø	3
S11	5	, m		1	1	3	ð	Ø	Ø	1	1	3	6	1	5	3	2	2	1
	6	**	•	1	Ø	3	2	Ø	1	Ø	រ្	-1	Ø	3-	3	2 -	- 1	Ø	2
	7	Ψ.		1	1	7	1 .	1	5	Ø	1	4	3	4	4	5	s -	- 1	Ø
	8	<b>-</b>		3	1	1	Ø	Ø	Ø	1	Ø	4	6	2	3	3 .	3	4	i
	9	-	i	5	1	3	1	1	Ø	٠Ø	Ø	. 3	7	1	4	<b>3</b>	i	2	2
	1Ø	*	!	ð	1	3	2	1	2	Ø	2	1	Ø	4	6	5	3	Ø	2
	12	-	;	3	Ø	3 .	1	1	Ø	1	1	4	4	1	2	1 .	2	3	Ø
	13	, <b>-</b> .	ı	ŧ.	i	1	1	Ø	Ø	Ø	Ø	1	3	1	4 ~	2	3	1	Ø
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	21		£	3	Ø	2	1	Ø	Ø	Ø	Ø	2	2 ,	1 .	3	4	2	Ø	2
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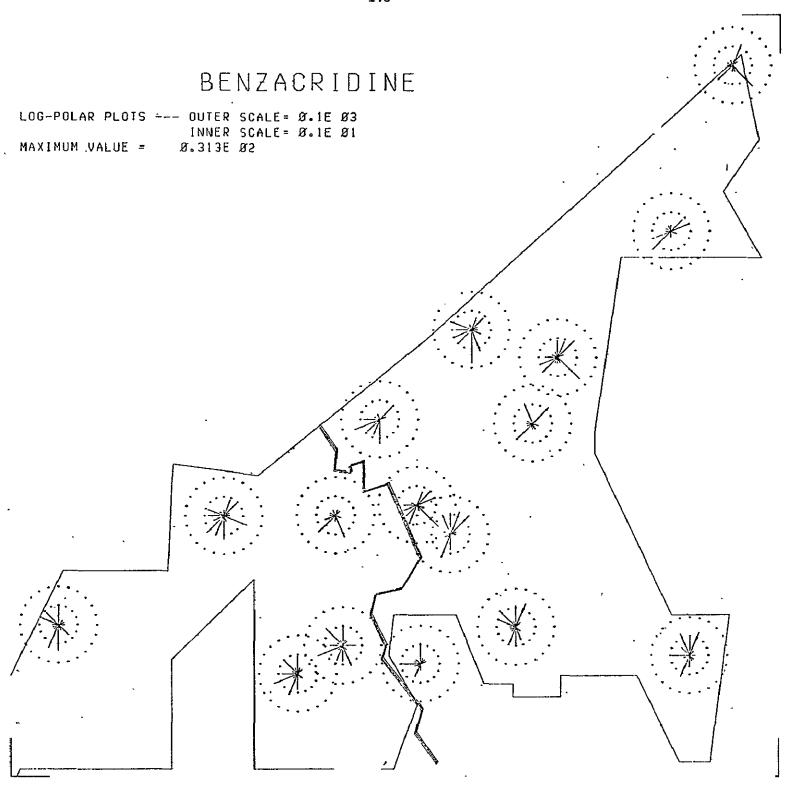


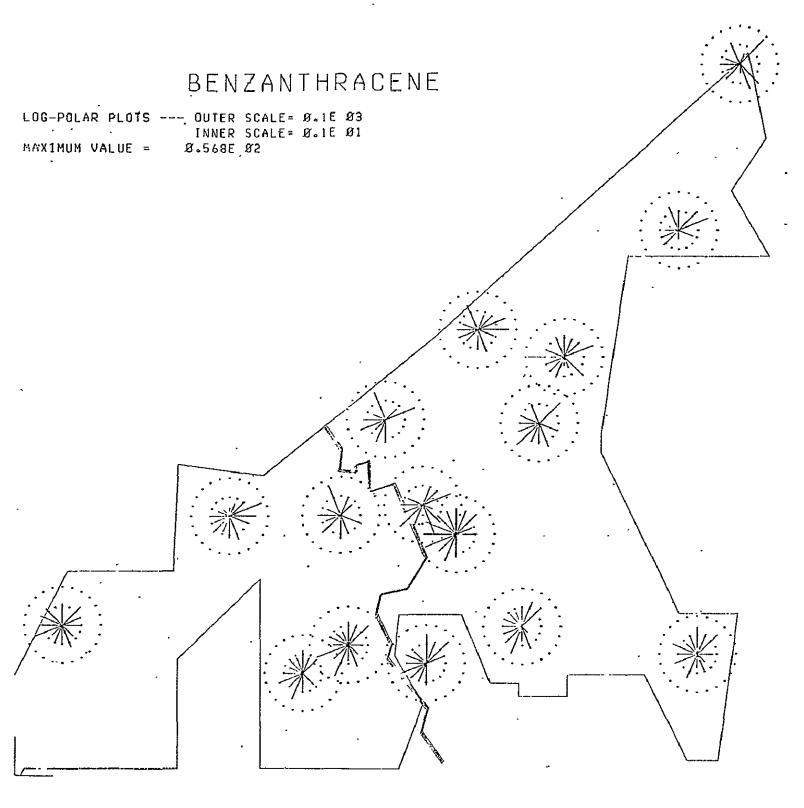
#### BENZACRIDINE

# NUMBER OF READINGS

#### WIND FROM

ENE E ESE SE SSE S SSW SW NNE NE WSИ 2 3 -1Ø 1 . Ø Ø Ø В Ø Ø 2 Ø Ø -1 Ø 2 . <u>- 1</u> -1 -1 8 3 10 2 2 ~ 1 15 -1 -1 8 -1 2 3 \_ -1 - 1 13 Ø - 1 Ø  $\mathfrak{F}$ -1 14 Ø **- i** Ø -1 2 - 1 -1. 15 Ø -1 Ø Ø Ø I 1 - 1 17 3 Ø -1 -1 -1 ១ន Ø -1 Ø ß - 1 21 Ø Ø Ø 1 1 1 -1





### BENZANTHRACENE

# NUMBER OF READINGS

#### WIND FROM

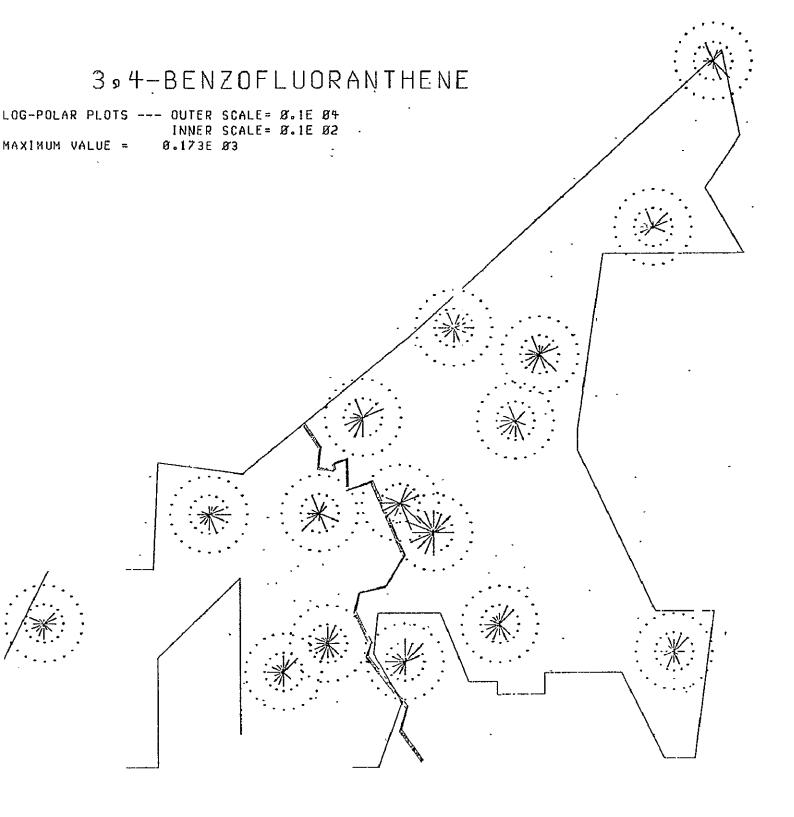
			N	NNE	NE	ENE	Ε	ESE	SĖ	SSE	S	SSW	SW	พรพ	, W	MNM	ИМ	NNW .
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3,4-BENZOFLUORANTHENE.

# NUMBER OF READINGS

### WIND FROM

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ш. <del>⊢</del>	- 7	<b>.</b> .	1 .	1	7	3	1	1 .	B.	1	4	3 .	3	4.	5	2 -	-1	Ø
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	12	<b>-</b>	3	Ø	3	1	1	Ø	I	1	4	4	1	3	2	2	4	Ø
	13	<b>~</b>	4	1 .	1	1	Ø	Ø	Ø	Ø	1	3 .	1	4	5	3.	1	Ø
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	17	<b></b>	1	1	5	3	B.K.	Ø	1	1 -	- 1	3	3	5	3	4	Ø	2
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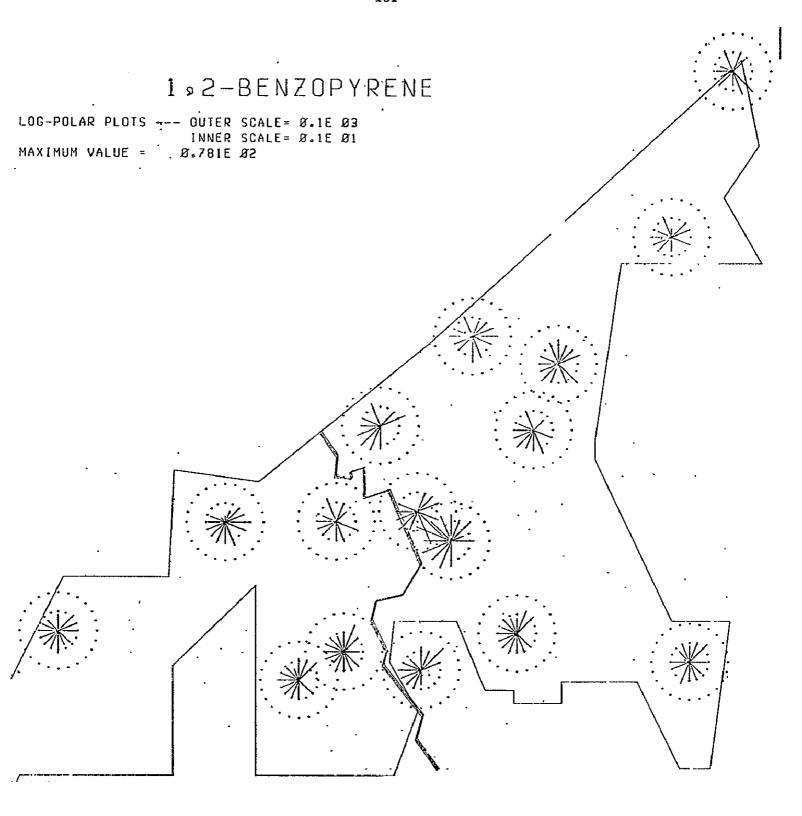


### 1,2-BENZOPYRENE

## NUMBER OF READINGS

### WIND FROM

		N	,NNE	NE	ENE	· E	ESE	SÈ	SSE	Ś	รรม	SW	MSM	M.	MNM	NW	NNN.
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3	*	4	1	2	Ø	1	B	i	1	5	6	1	4	3.	.4	4	1
4	**	Ø	Ø	1	Ø	Ø	1	Ø	1	1	2 .	5	а.	5	s .	Ø	3
. 5	#	1	1	3	ø	Ø	Ø	1	1	3	6.	1	2	3	2	2	. 1
6	<b></b>	1	Ø	3	3	Ø	1	Ø	Ø	1	Ø.	3,	3	2	1 .	ø.	2
7		-1	1	7	3	1 .	2	Ø	1	4	3 .	4 .	4	5	2 -	-1	Ø
8	•	, 3	1	i	Ø	Ø	Ø	1	Ø	5	6	2	3	3	3	5	1
9	<b>.</b>	5	1	3 ,	1	1	Ø .	Ø	Ø	3	7	ì	4	3	1	2	5
10	page 1	Ø	1	3	2 ,	1	2	Ø	2 .	1	Ø	4	6	6	3	ø	2
12	-	3	Ø	3	1	1	ø	i ·	1	4	5	1	3	2	5 .	4	Ø
13		4	1	1 .	1	Ø	ø.	ø.	Ø	2	3	1	4	2 .	3	1	ø
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15	н	Ø	1	3 _	Ø	Ø	5 .	Ø	1	r	ø	2	4	,2	3 .	Ø	2
17	÷	1	1	5	3	ø.	ø.	1	1 -	· 1	3	3 .	5	3	4	Ø	2
28	-	Ø	i	3	Ø	Ø	Ø	1 .	1	1 .	Ø	2	2	3	2	Ø.	2
21	-	Ø	Ø	3	1	Ø	Ø	Ø	Ø	3 :	2	1:	3	4	2	B	2

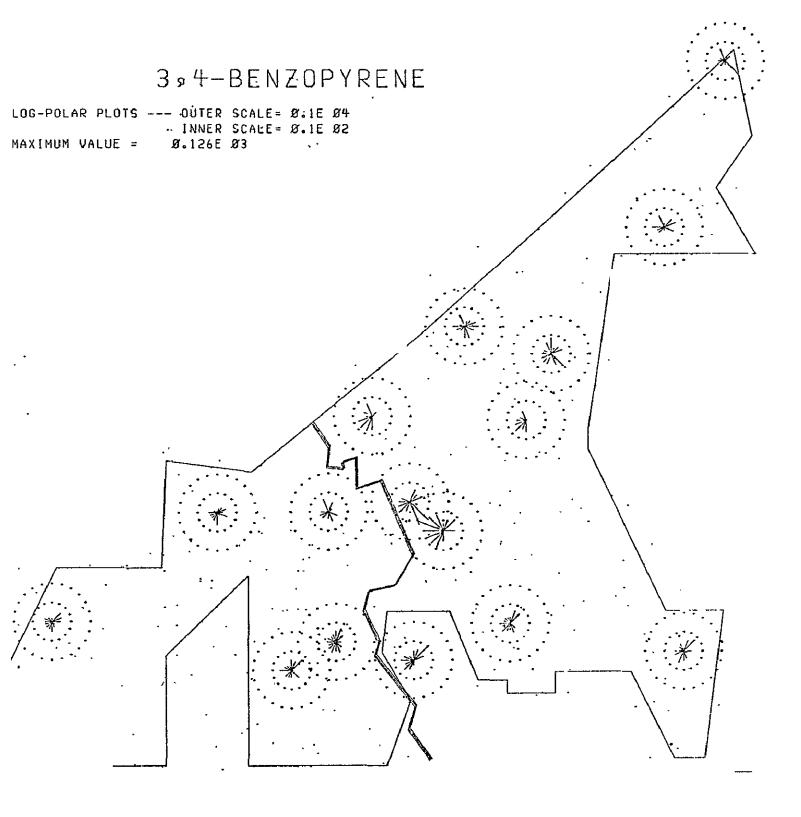


### 3,4-BENZOPYRENE

# NUMBER OF READINGS

### WIND FROM

		N	NN	E NĖ	ENE	Ε	ESE	şΕ	SSE		SŚW	SW	WSW	W	MNM	NW	NNW
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3	-	4	1	2	Ø	1	Ø	1	1	5	4	1	<sup>.</sup> 3	3	4	4	1
.4		Ø	. Ø	. 1	Ø	Ø.	-1	Ø	-1 ,	1	2	5	. 2	5	2	Ð	3
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6	<b>#</b>	1	Ø	3	2	Ø	1	Ø	Ø	1	Ø	3	3	2	1	Ø	2
7	-	1	1	7	3	1 .	2	Ø	·- 1	4	3	<b>'</b> 4	4	5	2	-1	Ø
8		· 5	1	1	ø	Ø	Ø	1	Ø	4	4	2	1	3	3	5	1
9	-	1	I	. 3	1	1	Ø	ø	Ø	3	7	1	4	3	1	2	2
18		Ø	1	3	2	1	1	Ø	2	1 .	Ø	4 .	5	٠6	3	Ø	2
12.	<b>.</b>	3	Ø	3	1	1	B	1	1	4	5	1	2	2	2	4	Ø,
13	-	4	1	1	1	Ø	Ø	Ø	Ø	1	3	1	4	2	3	1	Ø
14		2	1	1	Ø	1	Ø	1	1	1	2	Ø	3	5	1	3	2
15	<b>.</b>	Ø	i	2	æ	Ø	2.	Ø	1	1	Ø	5	4	2	3	Ø	2
17	₩	1	1.	5	2	Ø	æ	1	1	- 1	3	3	5	3	3	Ø	2
28	-	Ø	i	3	ø.	.8	Ø	1	-1	1	ø	2	2	3	2	Ø	2
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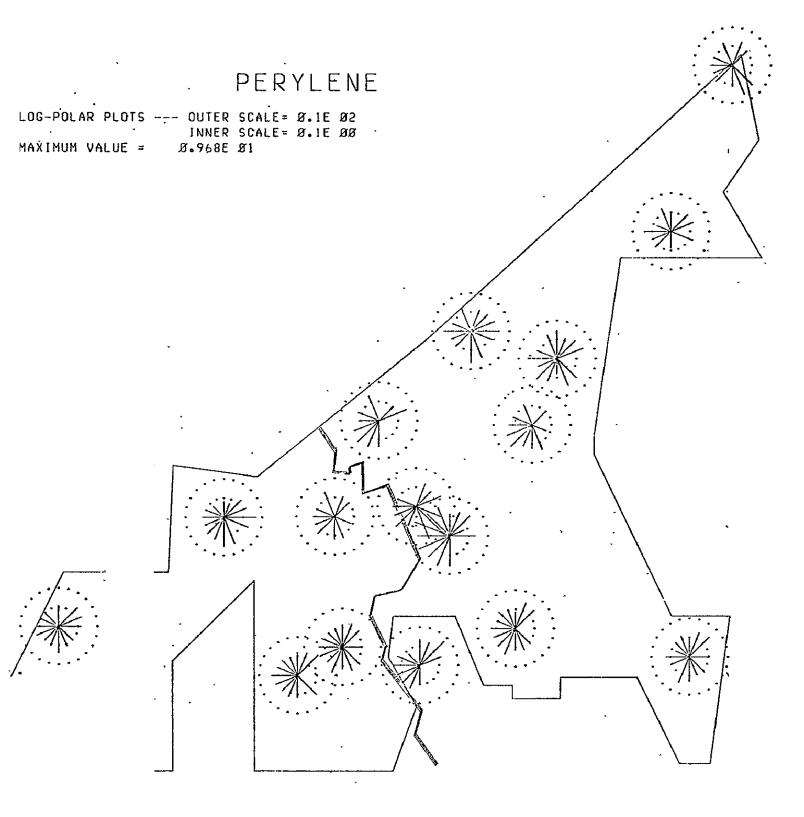


### PERYLENE

# NUMBER OF READINGS

### ND FROM

			N,	NNE	NE	ENE	Ε	ESE	SE	SSE	Ş	SSN	SW	WSW	М	MMM	ИМ	иим
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	3	-	4	1	2	Ø	1	Ø	1	1	4	5	1	4	3	4	4	1
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	5	н	1	1	3	Ø	Ø	Ø	1	1	3	4	1	2	3	2	2	1
	6	<b>"</b>	i	Ø	3	1	Ø	1	·Ø	Ø	1	Ø	3	3	2	1	Ø	2
	, <b>7</b> .	-	1	1	7	3	1	1	Ø	1	4	3	4	4	5	2 -	- 1	g .
	8	148	2	1	1	Ø	Ø	Ø	1	Ø	5	5	1	3	3	3	5	1
	9	<b></b>	1	1	3	1	1	Ø	Ø	a	3	7	1	4	3 ,	1	2	2
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	12	*	3	Ø	3	1	1	Ø	1	1	4	4	1	3	1	2	4	ø
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	15	<b></b>	Ø	1	3	Ø	Ø	1	ø.	1	1	អ	2	<b>.</b> 3	2	3	ø .	.2
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	21	<b>.</b>	Ø	Ø	2	1	Ø	Ø	Ø	Ø	5	5	ī	3 .	4	2	Ø	2

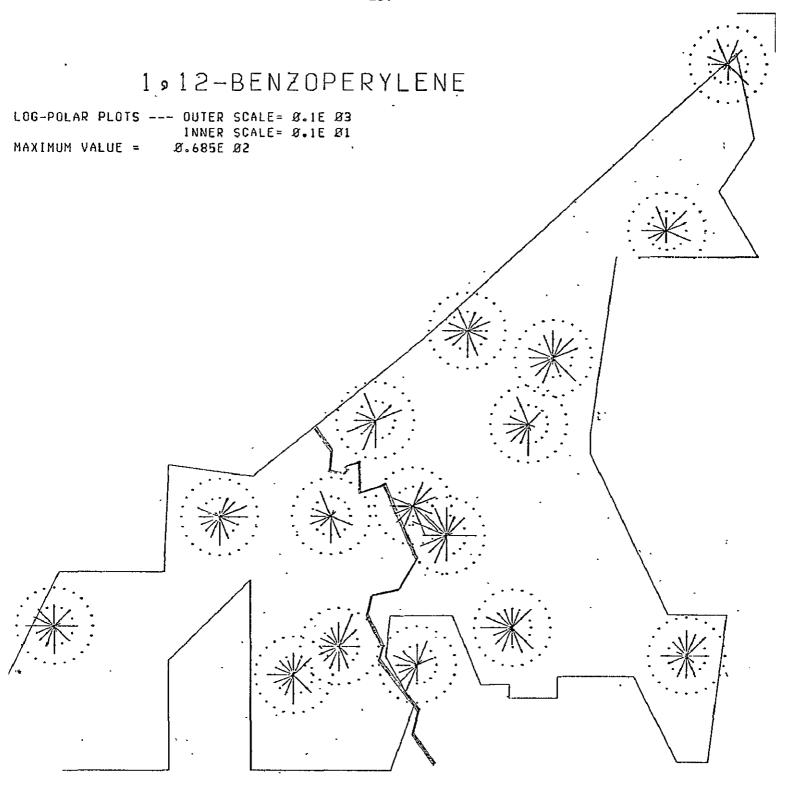


### 1 » 12 - BENZOPERYLENE

# NUMBER OF READINGS

#### WIND FROM

		N	NNE	NE	ENE	Ε	ESE	SE	SSE	s	SSW	SW	พรพ	W	MNM	'nм	NNW
			, ,	14 14	se +4	** **	•• ••					<b></b>			,		-
, 1	+4	Ø	1	2	3	Ø	1	1	1	Ø	1	3	3	4	1	Ø	Ø
3	<b>.</b>	4	1	2	Ø	1	Ø	1	1	4	6	1	3	3	3	3	1
4	-	Ø	Ø	1	Ø	ġ.	- <b>i</b>	. B	-1	1	2	4	2	4	2	Ø	2
5	-	1	1	5	Ø	Ø	Ø	1	1	3	5	1	s.	3	1 -	5	1
. 6	••	1	3 .	s	2	Ø	1	Ø	Ø	1	Ø	3	3	2	1	Ø	2
7		1	1	6	3	1	2	Ø	1	4	3	4	4	5	1 -	- 1	Ø
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. 9	-	5 ·	- 1	3 -	-1	1	Ø	Ø	Ø	3	7	1	4	2	1	S	2
18		Ø	1	s	2	1	s	Ø	2	1	Ø	4	5	5	2	8	1 .
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17	•	1	1	3	3	Ø	æ	1	1 -	-1	5 .	2	5 .	1	2	Ø	5 .
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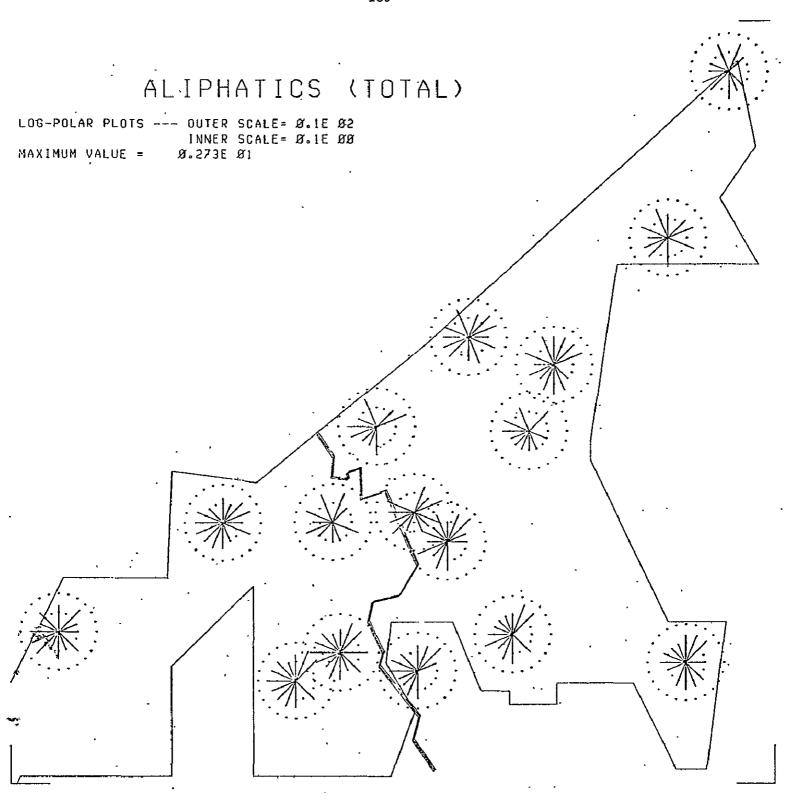


### ALIPHATICS (TOTAL)

## NUMBER OF READINGS

### WIND FROM

NNÈ NE ENE E ESE SE SSE S SSW SW WSW 2. 3 Ø 8 - I 2 Ø - 1 1 Ø Ø -1Ø 3 3 - 1 1 3 B -1 -1 Ø Ø Ø Ø 1 Ø 3 2 -} Ø 10 3 -1 1 Ø 1 1 1 12 -2 Ø -1 Ø 1 -1 2 i 3 Ø · Ø 13 2 . 14 Ø Ø 2 -1 15 ø. Ø S 2 17 -28 Ø 2 Ø Ø 1 1 Ø 2



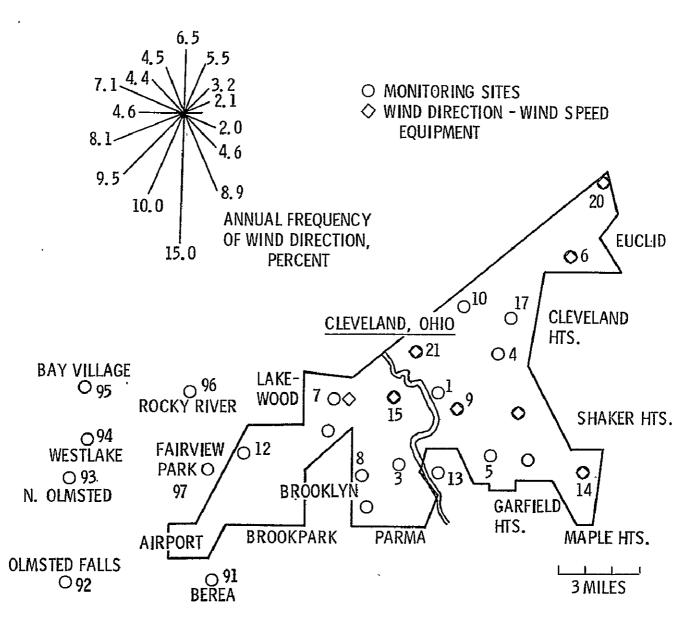


Figure 1. Sampling site locations.

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